

AUTOMOTIVE INDUSTRIES

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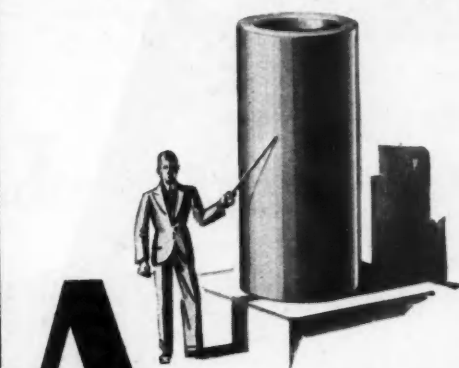
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Automotive Industries



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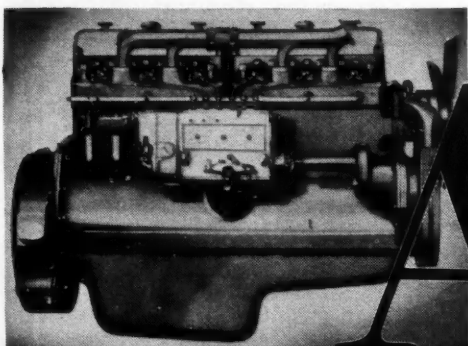
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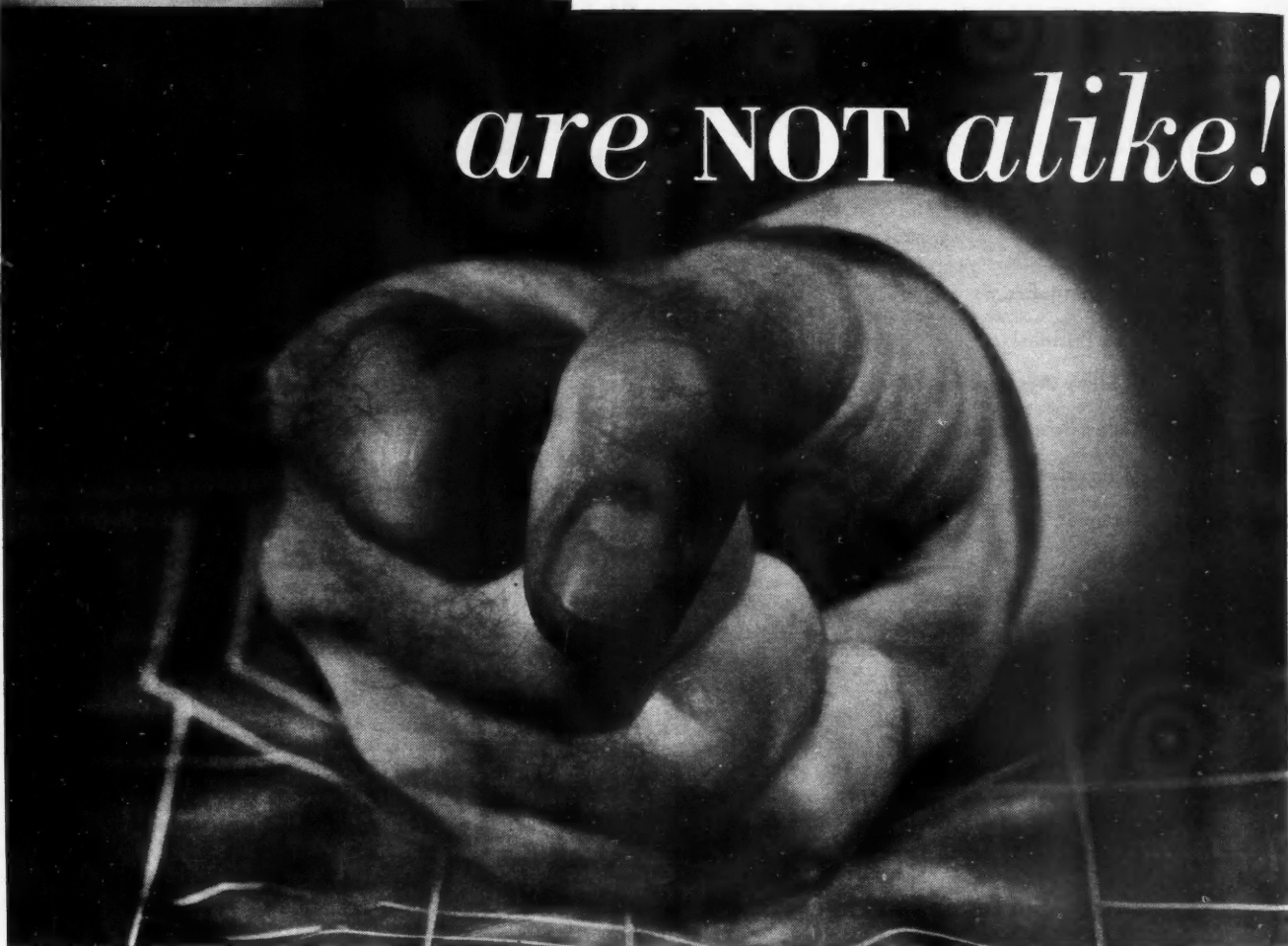
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November 23, 1935



ALL DIESELS

are NOT alike!



The chief difference between the Waukesha Comet Diesel and ordinary Diesels is in the combustion chamber.

The Comet type chamber . . . designed and patented by Ricardo . . . is a separate insert, surrounded by a heat insulating space, which gives the chamber a high heat holding capacity. It is spherical in shape for compactness of form, while the 'shape and tangential location of the entrance secure maximum air movement or turbulence within the chamber itself. This high air velocity prevents delayed ignition and, as a result, the Comet Diesel runs with a clear exhaust and great smoothness. These features, combined with easy starting, make the Comet the accepted type for vehicle work everywhere. Write for Bulletin 1001. Waukesha Motor Company, Waukesha, Wisconsin.

WAUKESHA ENGINES

November 23, 1935

Automotive Industries

Mounting Orders Indicate Buying Change

Car Demand Taxes Plant Capacities; Could Sell 275,000 Units in November

BY HAROLD E. GRONSETH
Detroit News Editor, AUTOMOTIVE INDUSTRIES

THE strong off-season demand which has developed for new lines of automobiles is convincing motor officials that buying habits can be changed. Currently mounting retail orders are piling up evidence to prove it was not so much the season that kept sales volume in fall months at its former small percentage of the total year's business as the absence of new model stimulus and the natural aversion to buying new cars that would be outmoded in January.

The public's response to early announcement of the industry's 1936 offerings has exceeded expectations of the manufacturers. While dealers this year were better sampled on new cars than they have been for several years they still are far short of the market's requirements, and the inadequacy of field stocks will limit materially the current month's retail deliveries.

November's volume therefore, which stood a good chance of approaching the best level of the year, will depend entirely on the availability of cars for delivery and will not be a criterion of the demand that exists. A better gage will be had in a month or two when dealers are fully supplied. Deliveries this month could range anywhere from 225,000 to 275,000 passenger cars with trucks somewhere around 25,000.

(Turn to page 680, please)

Ahrens Succeeds Chick As Cadillac Sales Mgr.

N. Dreystadt, general manager of Cadillac Motor Car Company, announces the appointment of Don E. Ahrens as general sales manager to succeed J. C. Chick, resigned.

Entering the automobile business in 1916, Mr. Ahrens for eight years was a Cadillac Distributor in the Pacific Northwest.

Chicago Show Attendance Passes February Mark

A. C. Faeh, Chicago Show Manager, reports attendance at show Wednesday night passed 225,000. This is more than attended the entire show in February. Sales are generally 30 per cent over the February mark.

Automotive Industries

AIWA-MESA Strike At Motor Products

Controversy Over Change from Piece to Hour Rate Closes Key Parts Plant

Motor Products Corp., one of the key parts plants of the motor industry, was closed this week as result of strike called jointly by the Automotive Industrial Workers Assn. and the Mechanics Educational Society of America, representing production and maintenance workers respectively.

The strike, called on Friday last week, was precipitated by a controversy growing out of change from piecework to straight hourly rates. To avoid disturbance, the plant was closed and those who reported for work Saturday were sent home to await call to return. While no reliable estimate can be had

(Turn to page 681, please)

Workmen's Insurance Rate Increases Of 50% to 100% Probable in Calif.

Special to AUTOMOTIVE INDUSTRIES

Motor manufacturers with assembling plants in California face increases in compulsory workmen's compensation insurance rates ranging from 50 to approximately 100 per cent of current charges.

Proposed in order to provide additional coverage of silicosis risks for compensation insurance carriers, the

For "Shame"



ROY H. FAULKNER

... who advocated in Toronto emblazoning scarlet "R" on cars of convicted reckless drivers to help reduce "our terrible traffic toll."

MEMA Members 197 to 7 Against Revival of NRA

Returns to date from balloting by members of the Motor and Equipment Manufacturers Association indicate 197 firms with 91,911 employees, do not want a return of NRA in any form. Seven manufacturers with 8613 employees reported that they favored an NRA, but five of these stipulated so many conflicting reservations that A. H. Eichholz, general manager of the MEMA, considers their votes as negative.

scheduled surcharges mean a tremendous increase in operating costs to California manufacturers in the event they are not modified before Jan. 1, the effective date.

Running as high as 990 per cent over current rates in some instances, the proposed surcharges apply to some 70 occupational classifications. Of par-

(Turn to page 681, please)

November 23, 1935

More NYC Trolley Cars Bow to Buses

Rattlers Retired from Central Park-8th Ave.: Others Scheduled to Go

Motorization of New York City's surface transport facilities moved a step nearer completion last week when modern streamlined buses replaced ancient, rattling trolley cars on Central Park West and Eighth avenue.

Antiquated perpetual franchises, complicated holding company structures, involved financial set-ups and political bickerings delayed this modernization move for many years. However, Mayor LaGuardia upon assuming office immediately set the wheels in motion to effect new franchises giving the New York Omnibus Corp. the legal right to discard the out-moded trolley cars for the modern bus on its principal routes.

The first step toward the city's surface transportation rejuvenation was the placing in operation of buses on the Madison-Fourth avenue line early this year. The total cost of the project will be about \$13,000,000, of which approximately \$7,000,000 will be financed by equipment obligations on the new motor vehicles. The Fifth Ave. Coach



New York "rings out the old, rings in the new"—Central Park West and Eighth avenue scene when antique rattlers gave way to modern streamlined buses.

Co., holder of more than 50 per cent of the income bonds, has agreed to the plan and promised to underwrite cash needed for the new equipment.

The only transportation line operating in the city to balk at the plan was the Third Ave. System, controlling lines operating on Broadway above 42nd street, and a number of cross-town lines.

Butane, Diesel Fuel Discussions Feature SAE Regional Meeting

by A. LUDLOW CLAYDEN

Special telegram to AUTOMOTIVE INDUSTRIES

With an attendance of 200, drawn from the four Pacific Coast Sections of the Society of Automotive Engineers, and from the Eastern group of those who attended the A.P.I. meeting in Los Angeles the previous week, the first regional meeting of the S.A.E. to be held in San Francisco proved to be one of the most successful of the Society, under the regional meeting plan launched a little over a year ago.

Most active discussion followed the presentation of a paper on "Butane Application and Performance in Automotive Service," by P. W. Ensign, of the Ensign Carburetor Co., Ltd., Los Angeles. Mr. Ensign stated that a conservative estimate placed the consumption of liquefied-gas fuels on the Pacific Coast for 1935 at 8,000,000 gallons. When engines were especially designed for such fuels, Mr. Ensign continued, much better performance would be possible. Were the prices of butane and gasoline equal today, butane would show a sufficient lowering of maintenance and operation costs to justify its use in truck-fleet operation.

He emphasized that conversions to butane must be skillfully done, and pointed out that until special engines are available, the best results are to be expected from conversions of the larger truck engines.

In discussing the paper, several speakers pointed out that there seemed to be some inconsistency in talking about polymerizing butane to get a yield of 60 per cent gasoline, because the butane was a much better fuel than gasoline could ever be.

The paper on "Diesel Fleet Operation and Maintenance Problems" by C. T. Anthony, Pacific Freight Lines, was packed with figures to show that great savings are possible as long as Diesel fuel continued cheaper than gasoline. Mr. Anthony left the impression on some auditors that the future of the Diesel engine for trucks depended mainly upon continuing fuel prices at least no higher than those for gasoline, pointing out that maintenance of Diesel-powered trucks was higher than that for gasoline trucks, but that this might change with time.

A vigorous discussion on gasoline knock testing followed that paper on "Gasoline Knock Testing" by C. F. Becker, supervisor of motor laboratory, Associated Oil Co. It was pointed out during the discussion, that California sells much gasoline on octane specification for Eastern shipment, so that high accuracy in testing has a real importance for California refiners. Some valuable suggestions were offered for

(Turn to page 683, please)

Fall Car Introduction Boosts Crude Rubber Consumption

Reflecting the benefits that have accrued to the tire industry as result of the 60-day earlier showing of new car models, crude rubber consumption during October in the United States was 35.8 per cent greater than during October, 1934, and was 13 per cent ahead of consumption during September of this year. The figure for October was 42,436 tons.

Normally October is one of the slack months of the year for tire manufacturers. This year however due to the shift in the showing of new car models, the factories of the four major companies supplying the original equipment market, operated at capacity during late September and all of October. As the factories in the Akron district supply more than 70 per cent of the total original equipment market, this condition reflected itself beneficially in the city, producing stable employment.

With the tire industry enjoying during October the heavy original equipment buying that has heretofore come in December, and anticipating during November and December the heavy ordering that usually comes in January and February, the industry's total original equipment shipments for 1935 will be materially boosted, and will exceed 16,000,000 casings. This market is supplied almost entirely by Goodyear, Goodrich, Firestone and the United States Rubber Co.

Reo, Studebaker, Announce Low Rate Financing Plan

In line with the general action of other car-producing companies, Reo and Studebaker have announced new low-rate automobile financing plans. Both companies have made arrangements through Commercial Investment Trust, Inc., to finance sales of their cars on the so-called "six per cent plan" for the 12-month period with one-half of 1 per cent added for extra monthly periods beyond the year basis.

Perkins' Trouble Shooters To Sift Goodyear Wrangle

Officials and employees of the Goodyear Tire and Rubber Co., are marking time in their wage and hour controversy awaiting arrival in Akron of the special fact-finding commission which has been named by Secretary of Labor Frances Perkins upon request of employees through their local union of the United Rubber Workers, AFL, and also through action of the House and Senate of the Goodyear employees industrial republic. The commission, composed of Major J. I. Miller and Hugh S. Hanna of Washington and Fred C. Croxton, Columbus, former assistant director of unemployment activities in Ohio, is expected to start its study of the Goodyear situation this week.

The controversy hinges upon the reported plan of Goodyear to change factory operations to three eight-hour daily shifts instead of four six-hour daily shifts as established under the NRA. Employees claim this will lengthen hours without commensurate increase in pay, and will reduce operating forces and increase unemployment in Akron. Goodyear officials claim their program to start January 1 calls for maintenance of a 36-hour week with "stability of employment and flexibility of hours."

Employee-legislators of the Goodyear Industrial Assembly, which has a House and Senate patterned after the National Congress at Washington, took joint action protesting the move and calling for a referendum vote. The action was vetoed by C. Slusser, vice-president of the company. P. W. Litchfield, Goodyear president, then called employee committees into conference and presented a series of charts showing the fact that the tire industry had a production capacity far in excess of the market requirements. He claimed that "bottom" had not yet been reached on the renewal tire market, and that the country faced a necessary reduction in manufacturing and distribution facilities to restore the tire industry to a profit-making basis.

Goodyear employees claim several departments already are operating on the eight-hour shift. Locals of the Goodrich and Firestone chapters of the United Rubber Workers Union have endorsed the Goodyear local in supporting the employees in their fight for retention of the six-hour day.

Cleveland Tractor Plans Million Debenture Issue

The following registration statements have been filed with the Securities and Exchange Commission:

Cleveland Tractor Co. of Cleveland, seeking to issue \$1,250,000 of ten-year, 5 per cent convertible sinking-fund debentures, due on Nov. 1, 1945, and 75,000 shares of no-par value common stock

to be reserved for conversion purposes.

Kinner Airplane and Motor Corp., Ltd., of Glendale, Calif., seeking to issue 700,000 shares of \$1 par value capital stock, to be offered to the present stockholders of the corporation as follows: 350,000 shares at fifty cents a share and 350,000 shares at \$1 a share.

Early Show Date Steps Up Parts Workers' Hours, Pay

Figures just compiled and released by C. O. Skinner, executive secretary of APEM, show that the setting ahead of the 1936 automobile announcement date has practically doubled the usual September parts industry indexes. Productive employment figures show an increase of 33.5 per cent over the com-

parative period for last year, and the payroll for the industry shows an increase of 82.3 per cent.

The average hours per week per productive employee for this period have increased from 23.5 hours in 1934 to 33.4 hours per week in 1935 and non-productive employees show an increase in the hours worked from 33.4 hours per week in September of 1934 to 41.6 hours per week for September of this year.

Aluminum Industries Buys Dall Manufacturing Co.

Purchase of the assets of The Dall Manufacturing Co., Inc., of Cleveland, has been announced by Aluminum Industries, Inc., Cincinnati, manufacturer of aluminum alloy pistons. Manufacture of cast iron pistons for automotive vehicles, stationary and marine engines, refrigerators, and other industrial applications, will continue at the Cleveland plant, which will be operated as The Dall Manufacturing Co., Division of Aluminum Industries, Inc.

GM 10 Mos. German Sales Up 75%; Europe Hospitable to U. S. Vehicles

Germany leads this year in the improvement in automobile sales that is taking place in Europe, according to James D. Mooney, GM vice-president in charge of overseas operations, who returned last week from a short trip abroad.

Total German motor car production this year, Mr. Mooney said, will be close to that of France, and about two-thirds of the British level. Sales of his company's products increased 75 per cent during the first 10 months of this year over the same period of last year.

In Great Britain Mr. Mooney found that business men regard monetary stabilization as a far-distant prospect, and not necessary to continued economic improvement.



W. Ledyard Mitchell

"In the face of the strong nationalistic movements among world powers, I was deeply gratified at the hospitable reception accorded American manufacturers," said W. Ledyard Mitchell, vice-president of Chrysler and chairman of the board of the Chrysler export division, when he returned recently from a visit to the Paris and London shows. At both of these leading European shows the new Chrysler models were given preferential positions, he reported.

The attitude that classified motor cars as desirable but far from necessary is rapidly changing in Europe, according to Mr. Mitchell, and the industry is gaining greater recognition each year.



James D. Mooney

Farm Exports Expansion Linked With Domestic Recovery—Smith

"As an exporter of American motor vehicles, I am far more interested in seeing an increase in America's farm exports, for the influence that such an increase would have upon our domestic economy, than I am in seeing an increase in American automotive exports." This frank statement by Edgar W. Smith, vice-president, General Motors Export Co., in his talk on "The Automobile Industry's Stake in Foreign Trade," prepared for the National Foreign Trade Convention in



Edgar W. Smith

Houston, Tex., this week, probably surprised those who think of export men as turning their backs on the domestic field, and seeking only to ferret out every possible sales opportunity in obscure corners of the world. Mr. Smith was unable to attend the convention and his talk was read by Harry Tipper.

Continuing his explanation, Mr. Smith stated: "If that sounds like a loose statement, I have only to remind you that the greatest total improvement in our total business in the past two and a half years has come in the agricultural areas right here in the United States. That improvement has come because the farmer is getting prices for the things he produces which are high enough to enable him to begin buying motor cars and other consumer goods on which the prices have not changed."

Mr. Smith urged that the "efficient industries," which he defined as those able to export and compete freely in world markets, declare openly and boldly for a partnership with the farmer—an economic and political partnership—in support of an increased two-way foreign trade.

"To do this," he added, would mean that we would be called upon to break the unnatural partnership that is at-

tributed to us today with those other non-exporting industries which are existing in the United States solely by virtue of high tariff protection and at the expense of the consumer and taxpayer."

Mr. Smith outlined the progress that the automobile industry has made abroad since March, 1933. In the non-manufacturing markets of the world, outside the United States, Canada, Germany, France and the British Isles, the American motor car has increased its sale 134 per cent over the low point, and is today 43 per cent short of the peak volume reached in the middle of 1929.

George F. Bauer, export manager of the Automobile Manufacturers Association, described to the convention plans for the "Two-Way Trade Fair," which is to be held in the Port Authority Commerce Building, New York, during the last two weeks of May, 1936. The object of the fair is to supplement the efforts being made to restore a larger volume of international commerce. It will provide an opportunity for foreign buyers to visit the United States and see in one building a large variety of American products, and at the same time foreign exporters will be able to exhibit their own wares.

Harry Tipper, executive vice-president of the American Manufacturers Export Assn., spoke at length on "The Value of Trade Agreements." Outlining the necessity for business policy to seek to combine immediate improvement with the establishment of a broader basis to assure the continuation of that improvement into the more distant future, Mr. Tipper said: "It is this combination of the provision of immediate advantages and the establishment of a broad base upon which future benefits may rest that has distinguished the operation of the trade agreements program of Secretary Hull."

As an example of the successful working of this policy, Mr. Tipper cited the treaty signed with Belgium a few months ago. Records of the AMEA show, he said that not only those products which received concessions, involving a wide-spread list of industrial and agricultural goods have enjoyed an increase of business amounting to 200 or 300 per cent, but other products not included in the treaty have profited to a very notable extent by the improved attitude and increased purchasing power arising from the mutual development of trade.

Independent Parts Maker Wins GM Patent Suit

The United States Circuit Court of Appeals for the second district has handed down a decision in the General Motors Corp. vs. Preferred Electric & Wire Corp. case favorable to the latter organization, according to an announcement in the N.S.P.A. News. This is the second time within recent months, according to N.S.P.A., that a federal

court has reaffirmed independent parts manufacturers' legal rights to produce, wholesalers to distribute and repairmen to install for service use parts other than those supplied as original equipment by car and truck makers. General Motors charged patent infringements.

Chevrolet AFL Union Asks Work Be Shared

Toledo Plant Reopened With 1100 Men Listed For Immediate Recall

When the Chevrolet Motors Ohio Co. plant reopened in Toledo, Monday, it was announced that 1100 men would be recalled to work and about 700 were taken back the first day. The plant had been closed a few weeks for shifting machinery. Some transmission business was transferred to Saginaw, Mich., and Muncie, Ind., and some axle business shifted into the Toledo plant.

Members of the United Automobile Workers No. 18384 (A.F.L.), voted Sunday to return to work as called and to ask the company to share the work so as to take back approximately 2200 men on payrolls when the layoff was put in force.

A. G. Gulliver, plant manager, met with the committee and said a four-day, three-shift operation could be put into effect to give that much work to 1400 workers but that was the best that could be done with present facilities. He said it would be uneconomic to adopt any plan by which workmen would be employed less than 30 hours a week.

Union officials have been informed that unreasonable demands of the shop committee must be forgone or the plant will be closed. The membership of the union will meet today (Saturday) at 2.30 p. m. for discussion of the share-the-work proposal brought back by their committee.

Johns-Manville, Gilmer Join in Sales Agreement

Johns-Manville and the L. H. Gilmer Co., Philadelphia, have signed a contract whereby the Johns-Manville Sales Corp. of New York will be the sole sales agents in the United States and Canada for the Gilmer company's automotive products. The arrangement becomes effective Dec. 1.

Mack Trucks-Reo Enter Manufacturing Agreement

Mack Trucks, Inc., and the Reo Motor Co. are understood to have arrived at a manufacturing agreement under which Reo will make a series of light trucks to bear the Mack name and to be sold exclusively by Mack merchandising outlets.

Russian 'Zis' Car an 8-In-Line With Over-Head Valves; Budd Makes Dies

A new luxurious seven-passenger automobile has been designed for production by the Stalin works in Moscow, Russia. Tools and dies are being ordered by a group of Soviet engineers at present in this country. They expect to begin production of the new car in about a year, and hope to reach an annual output of 20,000 to 25,000 a year. The new model is designated as "Z-1 Stalin," and is called more familiarly the "Zis."

According to the preliminary designs, the Zis will resemble the more conservatively stream-lined American cars. The body is unusually long, however, and there is a considerable overhang at both ends of the 136-in. wheelbase chassis. With the two large, comfortable auxiliary seats there is ample capacity for seven or eight passengers. The rear panel opens to give access to a luggage compartment, and additional baggage may be carried on a folding rack at the rear. Two spare wheels and tires are carried in front fender wells. The hood is somewhat longer than in most American cars of similar wheelbase, giving Zis an impressive appearance. Details of the power plant are not yet available, but it is understood that the engine will have eight cylinders in line, with overhead valves, and will rate about 90 h.p. The body will be of composite construction, with a soft roof.

A complete set of dies for the body, fenders, running boards, etc., is now being built at the Edward G. Budd Manufacturing Co. plant in Philadelphia, and will be ready for shipment to Russia in the early spring. Budd engineers have collaborated with the Russians in designing the body, and a number of them will be sent to Russia to assist in getting production started. Amtorg, New York, officials are letting contracts for the considerable quantity of special tools and machinery which will be needed, on recommendation of

the Russian engineering mission at present visiting this country. The Stalin works has so far specialized in building trucks.

Letter mails within the British Empire will, in future, be carried by air as far as practicable. This and other statements of broad interest are contained in the speech of Sir Eric Geddes, chairman of Imperial Airways, at the

eleventh annual meeting of the company, held in London at the end of October.

GM to Adjust Work Roster To Regularize Employment

General Motors' working schedules will be adjusted as far as possible in an attempt to give the greatest regularity of employment to the maximum number of workers, Alfred P. Sloan, Jr., president, promised the corporation's employees in a signed statement posted on the bulletin boards of all plants.

Showmanship Makes Chicago Show Year's Biggest Event

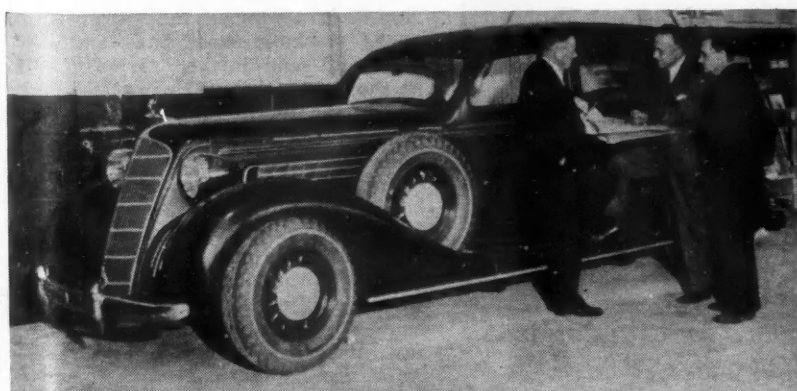
By GEORGE APPLEGREEN
Special to AUTOMOTIVE INDUSTRIES

Showmanship, exemplified in its most efficient manner, plus the room facilities necessary for all makes to display their complete lines, combined to establish the Chicago show as the biggest event of the year. Where other shows throughout the country have all reported smaller attendances than at previous exhibitions, the Chicago spectacle went ahead to set for itself an all-time high mark. Gross attendance for the first four days were 47 per cent higher than for the first four days of the affair in February. The net paid attendance was 42 per cent higher.

It was a buyers' show, too, as was evidenced by the reports from the floor. Sales in general were up as much as 40 per cent over the February sales. At nearly every manufacturer's display, factory representatives declared they were greatly in excess of anything that had been anticipated. From inquiries at all the displays it appears honors for having made the first sale



As thousands gasped — cars, models and furs revolved before great throngs at Chicago's Automobile Show.



Russian engineers at the Budd Manufacturing Co. plant with their new large sedan to be produced at Moscow plant. From left to right, they are V. N. Lialin, chief engineer; Walter Graf, Budd engineer, and I. I. Wittenberg, production manager, Zis plant.

can be claimed by Frank Crosby, of the Emich Chevrolet Co., of Oak Park. He was writing a bonafide order less than five minutes after the show opened last Saturday. A man and his wife came directly to the Chevrolet display. Pointing to a coupe she indicated her choice. "Make the order for delivery on Christmas Day," said her husband.

Over all other aids, the one factor which contributed to make the show a success was the arena idea. And, strangely, this was the one thing about which most people held misgivings before the show opened. There was a feeling that the arena show would detract interest from the floor showings. Actually, as it turned out, the arena was one of the main things which attracted people to the huge amphitheater and literally drove them to view the floor exhibits.

Motor Industry Gains Important Duty Reductions in U.S.-Canada Trade Pact

Consummation of the United States-Canada trade treaty brought to the automotive industry beneficent results in the fashion of greatly reduced import duties on finished products and component parts. In the agreement there appears to be evidence of an effort on the part of the pact negotiators to establish some degree of parity between car producers operating Canadian assembly plants and those of this country who must export their finished product across the nation's northern border.

In this give and take commercial agreement, lowered duties on automobiles and automotive products granted by the Canadians, range from eight per cent to 33 per cent on scheduled items. Automotive items are covered in Schedule 1 of the treaty and concerning these, the pact specifically states: "Articles, the growth, produce or manufacture of the United States of America . . . shall on their importation into Canada, be exempt from ordinary customs duties in excess of those set forth in the said schedule. The said articles shall also be exempt from all the other duties, taxes, fees, charges, or exactions imposed on or in connection with importation, in excess of those imposed on the day of the signature of this Agreement or required to be imposed thereafter under laws of Canada in force on the day of the signature of this Agreement. . . ." It is further provided by the agreement that neither this nation nor Canada "shall establish any prohibition or maintain any restriction on imports from territory of the other country which is not applied to the importation of any like article originating in any third country. . . . In matters concerning the rules, formalities or charges imposed in connection with any form of quantitative restriction on the importation of any article, the United States of America and Canada agree to extend to each other every favor granted to a third country."

Automotive men, particularly those closely associated with the export phase of the industry, have expressed their approval of the pact's conclusion. James D. Mooney, president of GM Export, said: "There is not the slightest doubt that it will stimulate trade between the two nations. If we broaden the base for trade, even the people who think they will be hurt will benefit along with the rest of us."

Robert C. Graham, Graham-Paige vice-president and chairman of the AMA export committee, wired President Roosevelt:

"Trade agreement with Canada announced today represents effective Government cooperation with industry and agriculture in stimulating world trade. Extend felicitations upon Sec-

retary Hull's able and courageous administration Trade Agreements program under your direction reflected in this dramatic recognition of mutual stake of neighbor nations in trade. Pact expresses motor industry philosophy that best assurance of expanding markets, likes through lowered costs to ultimate consumer as soundest business stimulant.

"Best wishes for continued vigorous prosecution Trade Agreements program which we believe has already demonstrated its value in bettering world economic conditions and minimizing causes of international controversy."

Some concessions in duties on automotive products granted by Canada to the United States in the Reciprocal Tariff Agreement include:

Automotive Items Affected By New Canadian Tariff	Present Duty Per Cent	New Duty Per Cent	Approximate Reduction Per Cent
Passenger cars (NOP*) \$1200 to \$2100; chassis	30	22½	25
Passenger cars (NOP) under \$1200, chassis ..	20	17½	12
Motor vehicles, all kinds (NOP), chassis	40	30	25
Tops, wheels, bodies (NOP), for motor vehicles	30	27½	8
Automobile engines and complete parts (NOP)	27½	25	9
Aircraft and complete parts, except engines.	27½	22½	18
Engines and parts for aircraft	27½	22½	18
Motorcycles, etc.	30	20	33
Tires	35	30	14
All manufactures of of rubber	27½	22½	18

* Not otherwise provided.

Hupp Sales Heads



George E. Clarke
Sales Manager

W. A. MacDonald
Director of Sales

Increased Tire Prices May Raise German Car Costs

Prices of German automobiles may have to be increased in the near future, according to reports from overseas. The increase will be brought about by rising tire costs, and is not expected to be

great. In spite of higher costs of other materials, car manufacturers have been able to keep their prices unchanged, and have so far absorbed higher tire prices as well.

One of Hitler's principal policies has been to encourage in every way the use of motor vehicles and automobile manufacturers have protested any further increase in tire prices. The tire manufacturers are requesting the German Ministry of Economics to find a possible solution of the problem.

Motor Sheet Takings Push Mills' Capacity

New Business Will Keep Detroit, Cleveland Steel Makers Busy Until Jan. 1

Impressively heavy buying of flat steels by automotive consumers was the outstanding feature of this week's market. Virtually all of the sheet capacity of Detroit and Cleveland district mills is in operation. New business in cold finished sheets will keep mills running at approximately the present rate over the remainder of the year, and buyers who wanted to be assured of mid-December deliveries had to be satisfied with promises that sellers would do the best they could.

Orders for sheets from automotive consumers are running high in those steel-making districts that otherwise show backwardness, such as Pittsburgh and Buffalo. Activity of strip mills also reflects striking gains in automotive business, being at about 60 per cent of capacity, compared with about half that rate in mid-summer.

American Iron and Steel Institute reports 53.7 per cent of ingot capacity in operation this week, the high for 1935 and the best rate since June 18, 1934.

Predictions of early advances in prices of flat steels and wire continue. It is said that hot rolled strip will be advanced \$3 a ton and cold rolled strip steel, \$5 a ton. Sheet prices, so market gossip has it, will also be moved upwards to the extent of \$3 @ \$5 a ton. Non-integrated sheet mills are reported to be stocking sheet bars and other forms of semi-finished forms of steel at the prices that were in effect previous to the recent \$2 per ton advance. This will enable some of these rolling mills to carry over into 1936 several months of raw material requirements, bought at a saving of \$2 per ton. Trade opinion varies as to whether steel bar prices will be revised upwards. Recent changes in the price card for steel bars, while entailing advances to small consumers, put tonnage buyers on a more favorable basis than they had enjoyed before the change. Therefore, some hold to the belief that an upward change in steel bar prices will follow advances in flat steels and wire. Automotive buying of bolts and nuts has turned heavy.

Chevrolet is reported this week to be buying sheets for approximately 100,000 cars. The purchase is expected to run in the neighborhood of 30,000 tons.

Pig Iron—Middle West automotive foundries are reported to have placed some orders for additional pig iron deliveries at the \$1 per ton higher quotations that went into effect Nov. 1. The bulk of current automotive requirements, however, is covered by contracts made before the \$1 advance went into effect.

Aluminum—Firm and unchanged. Piston metal is in brisk demand.

Copper—The copper market interprets the provisions of the new Canadian-American trade treaty as making for little change in the competitive status of copper of Canadian origin in the United States market, but that they somewhat improve the marketing opportunities of American manufacturers of copper and brass products, such as automotive brasses, in the Dominion market. Conditions in the domestic copper market are unaltered.

Tin—Spot tin continues in tight supply, the premium for immediate delivery over December being 2½ cents a pound with Straits held at 52 cents at the week's beginning. Straits, for delivery during the first three months of 1936, is quoted at 48¼ @ 48½ cents.

Lead—Fairly active and steady.

Zinc—Quiet and unchanged.

DuPont to Distribute GM Stock as Dividend

Directors Declare Extra From Temporary Block; Permanent Holdings Firm

DuPont shareholders of record Nov. 27 will receive as an extra dividend one fifty-fifth share of General Motors common stock on Dec. 27 for each share of duPont common held. Declaration of the extra was voted by duPont directors at their meeting this week in Wilmington, Del.

Distribution of the fractional shares will be made from a block of 200,000 shares of GM common accumulated in odd lots over a period of years by the Delaware organization. This stock, according to a spokesman for the company, was acquired from sources in which the duPont corporation was interested and carried by it as a temporary investment since 1933 and possibly earlier. It is in nowise connected with duPont's permanent investment of 10,000,000 shares of General Motors common, nor will the fractional distribution in any way affect this permanent block of shares. At one time this special lot of stock ran as high as 281,000 shares, but has gradually been disposed of until at this time only the 200,000 shares remain.

In answer to a question of whether the company was using the GM stock for dividend purposes to preserve a larger cash balance for working purposes, the company's spokesman said such was not the case. It was pointed out that the company's cash reserve position is strong and that it was decided to distribute the General Motors stock as a dividend rather than dispose of it through the open market.

The directors also declared the regular 90 cents a share dividend on the \$20 par value common and the regular quarterly dividend of \$1.20 on the debenture stock. The former is payable Dec. 14 and the latter Jan. 25.

Two Will Remember

Thanksgiving Day
November 28
1895-1935

In Chicago, on the older date, the first automobile contest in America spanked the breath of public interest into a new-born babe—the automobile industry—mixed with the pungent odor of horses, a new smell which would accompany for decades faster transportation than the world had ever dreamed about.

Proudest on that day, forty years ago, were:

PEDRO G. SALOM (born April 12, 1856, in Philadelphia) who, as designer of the Morris & Salom

cance, than the fire spread by Mrs. O'Leary's cow, was the resultant firing of the American imagination. A horseless carriage had traveled 54 miles under its own power at the incredible average speed of 7½ m.p.h. Automobile



At 74—Charles E. Duryea

. . . lost money, kept interest in automobiles

contests sprang up throughout the land.

Nearly 55 million passenger cars manufactured!

Nearly 45 billion dollars spent for them!

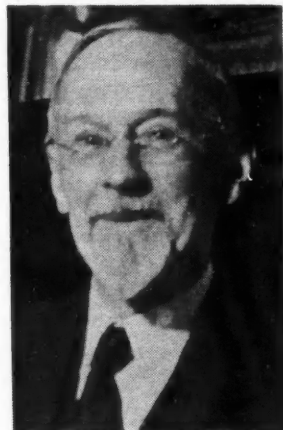
That's the record since 1895.

Looking backward on Nov. 28, 1935, will be Messrs Duryea and Salom. The advance weather reports promise rain or snow for the day, snow was the actuality in 1895. Only Chicago and Pedro Salom have changed. Duryea still lives, essentially in the period which followed his triumph at Chicago—refusing to believe that a three-wheeled "motor buggy" is not the solution to the problem of cheap mass transportation. Salom, wiser in his generation, stuck to the storage-battery field and is now in comfortable retirement. Both Salom and Duryea live in Philadelphia. Morris, Salom's partner in the "Electrobat" experiment, is long dead. Frank Duryea, at last report, is living in Chicago, remembered sometimes for his connection with the Stevens-Duryea car.

What happened in 1895?

"Six wagons had put in an appearance," reported *The Horseless Age* in its account of that day. The event was the first automobile race to be held in the United States. H. H. Kohlsaat, proprietor of the *Chicago Times-Herald*, had offered

(Turn to page 701, please)



At 79—Pedro G. Salom

. . . made money, lost interest in automobiles

"Electrobat," received the gold medal of the *Chicago Times-Herald*, for the most efficient vehicle entered in the contest.

CHARLES E. DURYEA (born Dec. 15, 1861, on an Illinois Farm), who with his brother, Frank, received \$2,000 for designing the only vehicle to complete the course of the Contest under its own power.

Faster, of wider human signifi-



Obverse and reverse of "Times-Herald" Medal awarded Pedro G. Salom in 1895.

U. S.-Canada Trade Treaty

Complete Schedule of Automotive Items On Which Duty Concessions are Granted

Canadian government men at Ottawa, Ont., roughly estimate Canadian automobile manufacturers and assembly plants benefit through the newly enacted United States-Canada Reciprocal Trade Agreement by a reduction of approximately \$3,000,000 yearly on imports of automobile parts and power plants from the United States. It is calculated that total savings through reduced tariffs will more nearly approach \$350,000,000 annually, but a portion of these will be for replacements. Under the general tariff about \$7,000,000 was collected on these imports from the United States during the fiscal year ended March 31. Important treaty terms affecting the industry in this country appear in the report on page 678, this issue.

Under the terms of the Agreement specific concessions granted this nation by Canada come under four general headings:

Below is published the schedule in full, so far as can be determined without benefit of regulatory interpretation.

With the announcement of the pact's consummation rumors became current in automotive circles that Studebaker would close its Walkerville, Ont., plant and remove all work to the South Bend factory. However, Harold S. Vance, Studebaker board chairman, spiked these rumors by stating that the tariff changes effected by the treaty would not warrant such action. Mr. Vance said he did not understand that nego-

tiation of the Agreement in any way changed the Canadian luxury tax situation and that this had been the determining factor in establishing a Canadian branch.

The Ford Motor Co. of Canada, Ltd., anticipating general effects of the treaty announced immediately after conclusion of negotiations between the nations a reduction in Canadian prices. Officials at the Ford plant in Windsor, Ont., pointed out the company is establishing its prices on the basis of treaty terms now in order to maintain maximum employment and dispel any uncertainty with respect to Ford V-8 prices.

The new prices are:

Model	New Price	Reduction
5-window coupe	\$640	\$25
Tudor sedan	655	20
Fordor sedan	730	25
3-window de luxe coupe.....	715	10
5-window de luxe coupe.....	695	15
Cabriolet	780	35
Tudor touring sedan	740	10
Fordor touring sedan.....	815	15
Light delivery	600	15
Station wagon	840	30
De Luxe panel delivery.....	730	25
Sedan delivery	740	25
All above models F.O.B., Windsor, Ontario. Bumpers, Spare Tires and Taxes Extra.		
131½-in. — 1½-ton standard truck chassis with cab.....	\$745	\$15
157-in. — 1½-ton standard truck chassis with cab.....	780	15
131½-in. — 2-ton standard truck chassis with cab.....	870	15
157-inch — 2-ton standard truck chassis with cab.....	905	15
131½-inch — 1½-ton truck panel (rear bumper extra).....	960	30
F.O.B. Windsor, Ontario, Spare Tires and Taxes Extra.		

Schedule of motor items on which tariffs have been reduced

Tariff Item	Article	Old Rate (Ad valorem unless otherwise specified)	New Rate (Ad valorem unless otherwise specified)	Per Cent Reduction
178 (178a)	Advertising & printed matter, n.o.p. (1)...	15¢ lb.	12½¢ lb.	17
322 a	Laminated glass & mfrs. n.o.p.....	35%	25%	29
390 c	Piston ring castings of steel.....	27½%	25%	9
394	Axles and axle bars n.o.p. blanks and parts, etc.			
	(a) for railway vehicles.....	35	30	14
	(b) for other vehicles.....	30	27½	8
	(c) n.o.p.	35	30	14
424	Fire engines and parts.....	35	30	14
427	Street cleaning machinery	35	Free	100
428 a	Automobile engines and complete parts n.o.p.	27½	25	9
428 b	Engines for trucks & buses over 100 hp. ...	27½	25	9
428 d	Magnetos & parts for mfg. internal comb. engines	15	10	33
428 e	Diesel and semi-diesel engines and parts.	30	25	17
434 a	Chassis for motor cars for railroads n.o.p.	35	30	14
438 a	Passenger automobiles n.o.p. \$1,200 to \$2,100; chassis	30	22½	25
438 b	Passenger automobiles n.o.p. under \$1,200; trucks; chassis	20	17½	12
438 c	Automobiles & motor vehicles of all kinds n.o.p.; chassis	40	30	25
438 e	Tops, wheels, bodies, n.o.p. for motor vehicles	30	27½	8
438 f	Motor buses, seating over 10; chassis, etc.	40	30	25
445 l	Electric storage batteries (Plates over 11 x 14 in.)	27½	25	9
448	Steel balls, for bearing of machinery and vehicles	10	7½	25
618 b	Tires	35	30	14
783	Internal comb. & steam engines, transms. assemblies, etc., not made in Canada for mfrs. of trucks	20	17½	12

(1) Not otherwise provided for.



Stanley Thomas
New Auburn
Chief Engineer

Mounting Orders Indicate Buying Change

(Continued from page 673)

Last month's delivery totaled 182,000 vehicles, of which 145,000 were passenger cars and 37,000 trucks. In November last year, when the market lacked the stimulus of new models, 107,574 passenger cars and 28,689 trucks were registered.

Production has been gaining momentum as plants have made successive increases in their schedules for the month. Some are setting all-time shipment records while new highs for November are general. Probabilities are that some let-down in plant activity will occur after the first of the year when dealers are fully supplied and the first flush of new model demand subsides. It would be too much to expect retail sales to hold at the current high levels through the winter months and while manufacturers are committed to a program of leveling the production curve an easing of the present feverish activity at the factories would still represent a vast improvement over other years. While assemblies may be somewhat curtailed, parts continue to be manufactured in good volume and stored until required for the heavier spring assembly operations thus maintaining more even employment.

The effect on Detroit employment of the changed manufacturing program is reflected in the Board of Commerce index which for Nov. 15 was 107.5 as compared with 51.9 a year ago and 101.4 on Jan. 15, a more nearly comparable date from the standpoint of new car announcements. Current employment in Detroit plants is not far short of the spring peak as represented by the Board's index of 110.9 for April 15.

Studebaker

Studebaker December schedule calls for 8800 cars, exceeding November out-

put by 2800 units and is a 33.3 per cent increase over December, 1934, according to George F. Keller, vice-president in charge of sales. At the new Los Angeles plant and at Walkerville, Ont., plants 200 passenger cars will be built. At South Bend the schedule calls for 7100 passenger cars and 500 trucks.

Chrysler-Plymouth

Both Chrysler and Plymouth retail deliveries showed increase of approximately 1000 cars for week ended Nov. 19, over previous week. Deliveries amounted to 3305 Plymouths and 209 Chryslers, all by Chrysler dealers.

Hudson-Terraplane

W. R. Tracy, vice-president in charge of sales, reports sales at shows running 100 per cent above those for January (1934) shows. Mounting orders at factory have caused considerable upward revision of operating schedules. A second production line is being put into full operation. Output to Jan. 1 calls for 33,500 cars, previous schedule, 25,000.

Chevrolet

Country-wide sales for first 10 days of November totaled 32,657 units, nearly double highest total for similar periods in previous years. This total sets new high mark for 10-day sales following introduction date. November and December production schedules forced upward because of continuing retail demand for new models, according to factory officials.

Lincoln

Order for more than 5000 Zephyrs for December delivery placed with dealers, according to factory report. These received prior to Nov. 15. Production now well under way with output being stepped-up gradually.

Oldsmobile

Sales throughout country from Oct. 1 to Nov. 10 up 67 per cent over same period last year, according to D. E. Ralston, Oldsmobile general sales manager. December production schedule stepped up to point where it will be company's second biggest production month.

AIWA-MESA Strike at Motor Products

(Continued from page 673)

of the number who actually walked out, it is believed that a majority of the company's 4000 workers are members of the unions which called the strike. Mathew Smith, general secretary of the MESA, said that his organization had 300 members in the plant, the AIWA 2800, the AFL 150 and a few hundred were unaffiliated.

The Auto Workers International Union, AFL affiliate, while not a party to the walk-out, later entered the dispute when members refused to cross picket lines as the company attempted to resume operations and asked their president, F. J. Dillon, to enter into negotiations with the management.

Smith said that conferences with the management have resulted in agreement on wage rates for 25 out of 33 classifications, but so far the company has stood pat on the remainder. He was hopeful of agreement on the other eight, and, putting teeth in his demands, has threatened to call out members of both the MESA and the AIWA in other plants. "There will be a lot of union meetings over the week-end," he said.

On the other hand, there are indications that the company has made all the concessions it intends to make and will fight it out to the finish. It has announced that on Friday, Nov. 22, all manufacturing employees would be paid off, which is taken to mean that workers then on strike will no longer be employees of the company, and that rehiring will begin in earnest. It is understood that the management has the support of the motor companies and that dies already have been removed and operations set up in other plants.

Dillon declined Smith's invitation to join with the independents in strike

meetings and negotiations declaring that no good purpose could be served and voicing his disapproval of dual unions in a plant. Dillon, however, accepted the challenge of Smith and Richard Frankenstein, national president of the AIWA, to ask the Regional Labor Board to hold an election to determine who should represent the workers in negotiations with the management.

AFL Would Return

Seven hundred Motor Products employees at a meeting Wednesday night conducted by the Auto Workers International AFL union voted to return to work provided there would be no change in their status as employees and provided proper protection is afforded. The AFL group has made no demands on the management, being forced out when the plant was closed as result of the walkout staged by the AIWA and the MESA. Representatives of the AFL union are negotiating with the management for return of their members. Of the more than 1200 present at Wednesday night's meeting 122 voted to remain on strike, others not voting were believed to be members of the unions on strike.

No provision for a plant election had been made by the Regional Labor Board by this noon. Members of the Board having been out of town, were not in touch with the situation and were just going into conference with union leaders. It was indicated that an election would not be held unless all parties to the dispute favored it.

Workmen's Insurance Rate Increases

(Continued from page 673)

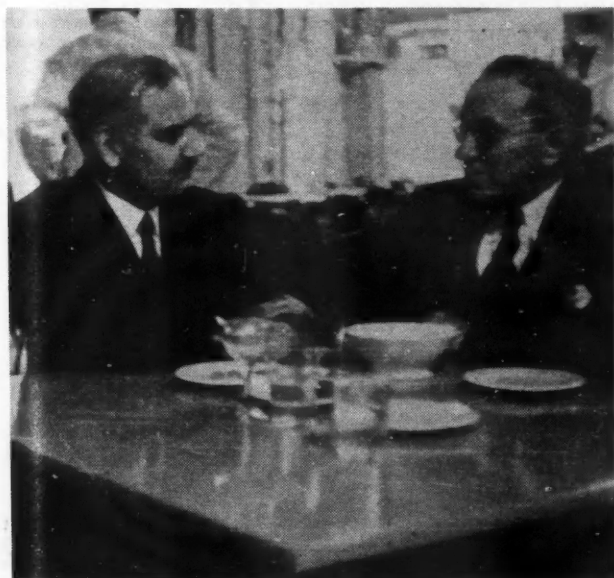
ticular interest to automobile men are the following items:

Automobile or aircraft engine manufacturing, current rate, \$1.67, added surcharge, \$0.84; auto manufacturing or assembling, \$2.65, surcharge, \$2.25; auto body manufacturing—pleasure car, \$2.24, surcharge, \$2.25; auto body manufacturing—trucks, \$4.52, surcharge, \$2.25; auto body manufacturing—no other classification—\$3.78, surcharge, \$2.25.

Application for the increases was filed by the California Inspection Rating Bureau, a rate estimating and "enforcement" agency of quasi-official standing which represents all compensation insurance companies and the State Compensation Insurance Fund as well.

Frederick W. Hicks

Frederick W. Hicks, works manager of the McCord Radiator & Manufacturing Co., was fatally stricken with a heart attack Sunday during the exciting fourth quarter of the Lions-Green Bay Packers football game at the University of Detroit stadium.



Alfred Reeves, AMA vice-president and general manager, (left) discusses progress of Chicago show with A. C. Fach, Chicago show manager. Mr. Reeves managed the New York Show.

The World On Wheels



William O'Neil (right), General Tire & Rubber president, shows Col. Roscoe Turner, sky star, General's new "Dual 10" tire with multi-vane tread.

Diesel powered road-rail car gets its first test on the Great West Road, near London, Eng. The vehicle can climb steps as well as navigate over various surfaces, as photo shows.

Acme Photo



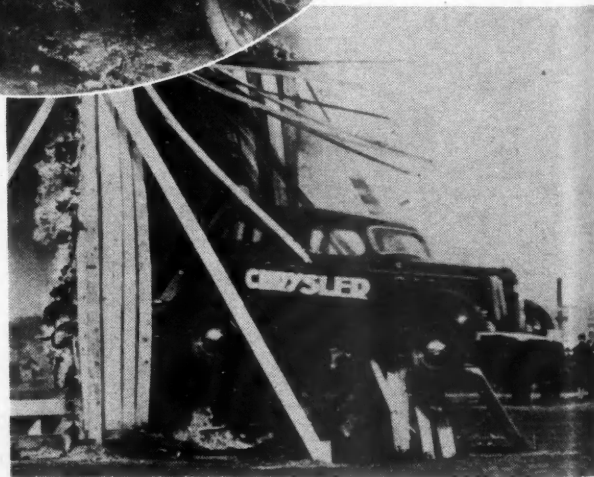
Sandwich men, French version, advertised the Chrysler circus of Hell Drivers. A large group of these poster panel boulevardiers pervaded Paris before and during the show.



Acme Photo

Budapest's Zoltan Sulkowsky and Gyula Bartha arrive in Southampton, Eng., on round-the-world motorcycle tour. Boys say they have covered 95,000 miles, passing through 63 countries of Europe, Africa, Asia, Australia and North and South America.

A scene from Chrysler's "Hell Drivers" circus staged at Issy-les-Moulineaux, first flying field of France, in conjunction with recent Paris motor show.



General's New "Dual 10" An "Accidental Discovery"

Through an accidental discovery General Tire & Rubber Co., of Akron, O., claims to have developed a new tire tread design (illustrated on "World on Wheels" page 682, this issue) that will materially increase motoring safety and prevent skidding on wet pavements. The new tire, known as the "Dual 10," was formally unveiled before 250 General salesmen at a special conference held in Akron last week. It is featured by a "multi-vane" tread which consists of thin rubber vanes running parallel around the tire. Two years of tests of the new tire under all road and speed conditions, have proved conclusively that the tire will stop a car quicker than any tire that has yet been developed, according to William O'Neil, president.

"The thin vanes of rubber under pressure and brake application produce a squeegee effect on the pavement. Hundreds of tests convince us that this new tire will stop a car, straight in its tracks, on wet pavement more quickly than any other tire will stop a car on dry pavement," Herman Kraft, General tire development engineer, said at the conference. In developing the tire Mr. Kraft was seeking a tread that would produce longer life, and not until the "multi-vane" tread was tested did the unusual non-skid property of the design become evident.

The new tire was presented before 400 General tire dealers from all sections of the United States, at the opening of their conference at the Akron offices Tuesday.

SAE Regional Meeting

(Continued from page 674)

improving the accuracy of the tests, and were noted for presentation to the Cooperative Fuel Research Committee.

As part of his paper on "Extreme-Pressure Lubricants Testing," G. L. Neely, research engineer, Standard Oil Co. of California, arranged demonstrations of the Almen, Timken and the new S.A.E. extreme-pressure testing machines, after describing the difficulties of the subject, the inconsistencies of the machines, and the difficulty of correlating their data with service tests.

A visit to the plant of the Caterpillar Tractor Co., at San Leandro gave those attending the meeting an opportunity to witness the building of Diesel-engine injection equipment, and the testing of every characteristic of Diesel engines. During the visit, C. G. A. Rosen, chief research engineer of Caterpillar, read a paper on "Diesel Injection in the Light of Fuel Properties." Another visit was made to the Oakland Bridge, now under construction. Trucks, tractors and Diesel-power units are the principal motivating agents being used.

Other papers presented at the ses-

sions held Nov. 18 and 19 at the Hotel Whitecomb, San Francisco, included "Practical Gasoline and Oil Problems in Trans-Pacific Flying Operations," by John C. Leslie, Pan-American Airways, Pacific division; "Automotive Fleet Maintenance Problems of the Pacific Coast," by S. B. Shaw, automotive engineer, Pacific Gas and Electric Co.; "Diesel-Fuel Knock Testing," by T. B. Rendel, in charge of automotive research laboratory, Shell Petroleum Corp.; C. B. Veal, research manager, and R. S. Burnett, standards manager of the Society of Automotive Engineers, attended the meeting and presented papers on "Cooperation the Keystone of S.A.E. Research" (Mr. Veal) and "The Standards Road to Profits" (Mr. Burnett). Chairmen of sessions at the two-day meeting included J. M. Evans, Associated Oil Co.; W. H. Fairbanks, Southern California Telephone Co.; J. R. MacGregor, Standard Oil Co. of California; and A. G. Marshall, Shell Oil Co.

The committee arranging the meeting was headed by Mr. Marshall, representing the Northern California Section of the S.A.E. and Colonel Fairbanks, representing the Southern California Section. The Oregon and Northwest Sections were included among the sponsors.

October Living Costs Increased Over Sept.

The National Industrial Conference Board reports wage-earners' living costs for October rose 0.5 per cent over the September level. Higher prices were reported for each of the major groups of expenditures comprising the wage-earners' budget. October living costs were 3.7 per cent above those of the 1934 comparable month; 17.3 per cent above April, 1933, the depression low point, and 16.9 per cent lower than October, 1929.

Graham-Paige

Graham-Paige Motors Corp. reports for the nine months ending Sept. 30 net loss of \$944,492, comparing with net profit of \$21,853 the year before.

United Air Lines Transport Corp. reports net income of \$304,566 for the quarter ended Sept. 30, as compared with net profits of \$107,326 in the preceding quarter.

Foreign List Gives ASI Show Cosmopolitan Air

The international interest the forthcoming Automotive Service Industries Show at Atlantic City, Dec. 9-13, has aroused is shown in the extensive list of visitors from 25 countries who already have signified their attention of attending the affair. From these countries, representing all quarters of the globe, approximately 60 delegates will journey to the New Jersey resort.

A recapitulation of the nations and territories to be represented shows Finland, one; England, six; Argentina, four; Mexico, D.F., eight; Belgium, two; France, four; Puerto Rico, four; Venezuela, one; Cuba, three; Canary Islands, one; Germany, one; Portugal, one; Ecuador, one; Holland, five; Sweden, one; Iran, one; Czechoslovakia, one; Spain, one; Philippine Islands, one; Denmark, two; Japan, one; Australia, one; South Africa, five. Brazil and Uruguay also will be represented.

The Overseas Automotive Club is cooperating with the show management in the entertainment of these visitors. They will be the guests of the club at the annual dinner held by the organization, which this year will be in the Hotel Ritz Carlton, Atlantic City. The dinner speaker will be Pyke Johnson, vice-president of AMA and in charge of the association's Washington office.

A complete list of all known foreign visitors who will attend the show has been compiled by the Overseas Automotive Club and is available through the Chilton Co. A letter addressed to the publishers of AUTOMOTIVE INDUSTRIES will secure the list without charge.

Edsel Fords Give \$75,000 to Detroit Community Fund

With a pledge of \$75,000 from Mr. and Mrs. Edsel B. Ford, the Detroit Community Fund went over the top in its drive for \$2,000,000. The Ford gift is \$15,000 greater than their last year's pledge of \$60,000 although during the past year they have contributed an additional \$10,000 to help meet the fund's deficit.

CALENDAR OF COMING EVENTS

SHOWS

Columbus Automobile ShowNov. 22-28
Cleveland Automobile ShowNov. 23-30
Montreal Automobile ShowNov. 23-30
Peoria, Ill. Automobile Show...Nov. 27-Dec.
Kansas City Automobile Show,
Nov. 30-Dec. 6
Milwaukee Automobile Show...Nov. 30-Dec. 7
Automotive Service Industries Show—
Atlantic CityDec. 9-13
National Motor Boat Show, New York,
Jan. 17-25

CONVENTIONS AND MEETINGS

Overseas Automotive Club, Annual Dinner, Ritz-Carlton Hotel—Atlantic CityDec. 11
S.A.E. Annual Meeting, Detroit,
Jan. 13-17, 1936
American Roadbuilders Assoc., ClevelandJan. 20-24
U. S. Chamber of Commerce, Annual Meeting, Washington.....April 27-30

The Horizons of

Helping the Farmer

THE flood of criticism of the New Deal, gathering momentum during the past 18 months, has touched gently or not at all a broad field of Federal activity. The opportunities for devastating condemnation which have been eagerly seized elsewhere seem in the matter of farm credit to be ignored. The field is rich and inviting for the political assailant. The mistakes made in the past have been numerous, glaring and costly.

Origin of Farm Credit

To obtain the setting for the present problem it is necessary to return to pre-war days and examine the gestation and birth of Federal agricultural credit. The farmer had suffered for years from an archaic credit system. A host of land mortgage companies, banks and insurance companies provided funds on terms which can only be described fairly as exorbitant. It is difficult to establish the fact with absolute certainty but there is much evidence to indicate that the average farm borrower in this country before the war paid no less than 10 per cent for money. Congress gave the matter long and careful consideration. It sent two delegations to Europe to study agricultural credit with particular attention to the Prussian Land Bank system organized by Frederick the Great. This had functioned successfully for a century and a half, providing ample credit on reasonable terms for the farmer and a safe medium of investment for the thrifty.

As a result of this study Congress passed the Federal Farm

Loan Act which established two types of lending institutions, the Federal Land Banks and the Joint Stock Land Banks. The former were essentially Government institutions and the latter private. Both sold tax-exempt securities the proceeds of which were loaned to farmers on the security of first mortgages.

A Bad Start

These institutions were born, unfortunately, at the wrong time. When they got under way the war boom was in full throb, commodities were reaching for peak price levels and land speculation was general. The organizers had no domestic experience to guide them. The temptation to use the banks for political advantage was too great. Appraisers were recruited from political riff-raff and hangers-on. It was said of one Federal Land Bank, whose past errors have since been atoned for by liberal contributions of Government capital, that no good Democrat ever failed to get a loan. Appraisers submitted reports that were a travesty upon banking. In one instance a broken-down, petty, southern politician who had obtained an appointment as appraiser recommended a loan because the view from the applicant's front porch was beautiful, because the grave of a noted Confederate hero was nearby and because the applicant had six children.

Can He Profit by Experience?

These errors of inexperience and maladministration eventually produced their crop of severe headaches. It is no part of our

present task to detail these and we bring the matter up merely to suggest that Uncle Sam as a banker has, in the past at least, been painfully unsuccessful. However the record of private banking in the land mortgage and other fields during the past generation has not been a record of unrelieved brilliance. It is possible that the Government may profit by its experience. In appraising its present efforts to help the farmer this possibility should in all fairness be entertained.

Regarding the great value of Federal credit to the farmer there can be no question.

The Toll of Depression

When the depression broke, the American farmer had a long term debt of approximately 9½ billion dollars. As farm prices dropped interest charges and taxes remained fixed. For 1932 these two items, i. e., interest and taxes, absorbed almost 25 per cent of gross farm income. In view of the fact that more than half of the farms were free of debt the burden on encumbered land was far more severe than this percentage would indicate. Credit by generous, and at times careless and venal, Government land bank system had so expanded the mortgage loans to farmers that the debt per acre in 1932 was more than three times as great as in the pre-war period. In the year ending March 15, 1933, 54 out of every thousand farms were sold either for taxes or in foreclosure proceedings. In other words one farm out of every 20 tasted the bitter dust of insolvency in that year.

The farm credit program has improved this situation in three ways.

Business

by Joseph Stagg Lawrence

1. It has exerted pressure upon creditors and induced them to scale down claims against farmers.

2. It has increased the total amount of credit which a farmer could obtain for long-term and for current needs.

3. It has reduced the carrying charges of the farm debt.

Scaling Down Debts

In response to suggestions from the Farm Credit Administration to state Governors, farm debt adjustment committees have been organized in more than 2700 counties. They have successfully negotiated voluntary debt agreements in more than 40,000 cases involving approximately \$200,000,000 of debt principal. Another type of adjustment has been effected in cases where the total of indebtedness was greater than any reasonable value of the farm. In many of these cases the total debt was refinanced by the Federal Land Bank on condition that it be scaled down to a point where the farmer would have a fair opportunity to support it. Such reductions have exceeded \$75,000,000.

Larger Loans

The farmer is now able to borrow up to 75 per cent of the value of his farm. This added borrowing margin has been used to liquidate other debts, to repair farm buildings and purchase equipment. Through production credit associations he is able to borrow up to 100 per cent of the cost of seed, fertilizer, equipment and livestock. The rate on these production loans is 5 per cent, and they may be

amortized over a period of three years. Farmers are urged by personal contact and through circulars to use this credit and thus avoid installment charges. Between December, 1933, and July, 1935, such loans have aggregated \$113,000,000.

Lower Rates

Finally we have the reduction in rates. These rates are not uniform and depend upon the nature of the loan and the time when the loan was made. It is probable that the farmer today can borrow \$7,500 on a farm which would carry only \$5,000 five years ago with total interest

charges on the larger loan no greater than on the smaller.

The immediate benefit of all this to the farmer cannot be questioned. We must also allow for its broader constructive effect upon business. The revitalization of farm buying power must in substantial measure be attributed to vastly improved farm credit conditions. The A.A.A. and a better relationship between supply and demand for farm crops cannot alone account for the remarkable increase in farm buying particularly of equipment and automobiles. The dangers of easy credit we have already indicated. They are no less real in agriculture than they are in business and in the stock market.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

General business continued to improve last week. Wholesale trade was larger; and, despite unfavorable weather in some sections of the country, retail trade registered further gains. The rate of industrial activity advanced, which is unusual at this time of year. Production of electricity surpassed the 1929 peak for the sixth consecutive week.

Car Loadings Decline

Railway freight loadings during the week ended November 9 totaled 653,525 cars, which marks a decline of 27,137 cars below those during the preceding week, an increase of 58,735 cars above those a year ago, and an increase of 77,425 cars above those two years ago.

Food Prices Rising

The index of retail food prices on October 22, according to the Bureau of Labor Statistics, stood at 80.5, based on the 1923-25 average as 100, as against 75.7 a year ago, and 97.8 on October 15, 1930.

Retail Sales Slower

According to the Board of Governors of the Federal Reserve System, the adjusted index of department store sales during October stood at 77, based on the 1923-25 average as 100, as compared with 82 in September and 79 in August.

Power Production Tops 1934

Production of electricity by the electric light and power industry in the United States during the week ended November 9 was 14.2 per cent above that in the corresponding period last year.

Construction Active

Construction contracts awarded in 37 eastern states in October, according to the F. W. Dodge Corporation, amounted to \$200,863,700, the largest total reported since December, 1933, which was the month of peak activity of the original Public Works Administration program. The current figure compares with \$167,376,200 for September and was almost 50 per cent above that in the corresponding period last year. The October increase was the result of an expansion in both private and public construction.

Lumber Production Up

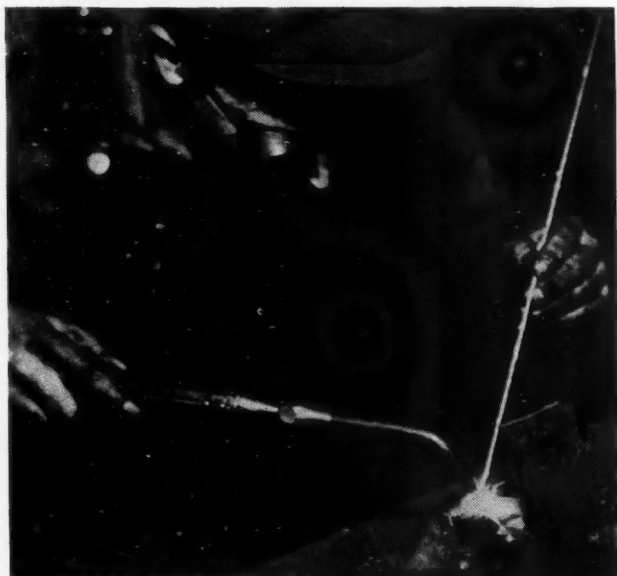
Lumber production during the five weeks ended November 2 was 59 per cent above that in the corresponding period last year. Shipments showed a gain of 45 per cent.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended November 16 stood at 85.0, which is the same figure as that for both a week and two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended November 13 showed an increase of \$2,000,000 in holdings of discounted bills. Holdings of bills bought in the open market and of government securities remained unchanged. Monetary gold stocks increased \$33,000,000, and money in circulation declined \$8,000,000.



ACETYLENE

changes in the welding procedure from that used on ordinary 18-8 stainless steel. The principle of a neutral flame and sufficient flux should be strictly followed. With columbium-treated plate and rod, backhand welding can be utilized to avoid the distortion that other methods of welding sometimes produce."

Wherever flame cutting of stainless steels is desirable in fabrication, alloys containing columbium or titanium lend themselves readily to this procedure, the elements serving to counteract harmful heat effects and eliminating the need for heat treatment after welding.

In "Hydrocarbon Fuel Gases for Cutting," Dr. George V. Slottman, of Air Reduction Sales Co., settled in scientific fashion the merits of using some of the abundant and relatively inexpensive saturated hydrocarbon gases instead of acetylene in large scale cutting and welding operations. He found these gases to be deficient in heating value and further that they require higher proportions of oxygen to accomplish the same result.

"It was found that the optimum oxygen gas mixing ratios for the highest flame temperatures were: for city gas, 0.75 to one; for natural gas, 2.0 to one; for propane, 4.5 to one; and for acetylene, 1.7 to one. In actual works practice these ratios are rarely achieved, due to the difficulty of adjusting the flame character by eye. In the case of acetylene, the mixing ratio may well vary from 1.1 to 1.5 to one, and in the case of propane for example, from 3.0 to 6.0 to one. The saturated hydrocarbon flames are particularly difficult to adjust, since their flame inner cone is not nearly as sharply defined as that of acetylene. It was further noted that the several gases cannot be compared on a heating value basis, because of differences in flame temperature and in heating efficiency; that the preheating oxygen requirements with the saturated hydrocarbons are higher than with acetylene, and that the cutting oxygen volumes to produce comparable cut quality are similar, with the saturated hydrocarbons, to those necessary with acetylene.

OUT of the proceedings of the 36th Annual Convention of the International Acetylene Association held in Cleveland, Nov. 12-15 inclusive, we have selected the group of four papers read at the symposium, on the metallurgy of welding and cutting, as being of most significance to automotive designers and production men. Brief notes on each of these papers are given below.

W. J. Priestley, vice-president, Electro Metallurgical Co., in his paper, "Welding and Cutting High Chromium Steels," showed how the cooperative efforts of chemists, metallurgists, and engineers resulted in the practice of additions of columbium and titanium to chromium steels to prevent air-hardening and to improve physical properties after welding.

Early experience with welding the 4 to 7 per cent chromium steels indicated that these steels were air-hardening and that consequently the weld metal and particularly the zone adjacent to the weld became hardened. Investigation showed that the two semi-rare elements titanium and columbium were effective in "locking up" carbon and preventing it from forming chromium carbides. The same problem has confronted foundrymen making castings of this analysis. Ordinarily, if gates and risers are removed by flame cutting, the casting may be rendered defective because of air-hardening and

subsequent cracking. Additions of titanium or columbium to the alloy have simplified the procedure and have eliminated all process difficulties. Columbium is said to be preferred in foundry practice since titanium may introduce certain casting difficulties.

Similarly the use of columbium and titanium is also effective in the welding and cutting of steels containing 12 to 30 per cent chromium.

The welding problem encountered in the chromium-nickel austenitic steels of which the 18-8 alloy is best known, is likewise due to the harmful effects of carbon but in this case it is due to corrosion rather than air-hardening. Carbon in these steels acts to destroy corrosion resistance by the formation of carbides along the grain boundaries. Again, columbium or titanium is used to lock-up the carbon and prevent it from being available for the formation of carbides.

"Since columbium is not lost from the weld metal during the welding operation, it is more satisfactory to use a welding rod containing columbium instead of titanium, regardless of what stabilizing element is used in the base metal. The presence of columbium does not complicate welding with the oxy-acetylene flame and the free-flowing characteristic of the columbium-treated 18-8 rods makes them ideally suited for this practice. The presence of columbium in the welding rod necessitates no

WELDERS

hear Priestly, Slottman, Zimmerman, Hoglund Discuss Science and Art of Fusing Materials at 36th Annual Meeting of International Association

"From the data presented, it is evident that the economy in the use of the saturated hydrocarbons as preheating fuels for steel cutting in place of acetylene, depends on the price of oxygen and that under the prevailing price structure such use is uneconomical."

Fabricators of steel plates will be interested in a progress report by Prof. J. H. Zimmerman of M. I. T., entitled "Further Studies of Oxy-Acetylene Cut Steel Plate." This report confirms the earlier study on ½-in. plate which indicated that flame cutting produced no harmful effects as compared with various metal cutting procedures. The present project dealt with plate ranging 1 in., 1½ in., and 2 in. in thickness.

It was found that the hardness of the cut surface as well as the depth of the affected area are not much influenced by the thickness of the plate. Increase in hardness is neither significant nor objectionable and the depth of the affected region does not amount to more than 0.1 in. regardless of plate thickness.

Although the project is not by any means completed, the finding to date should be reassuring not only to the fabricators but to the users as well.

"Gas Welding of Aluminum and Its Alloys," by G. O. Hoglund of the Aluminum Co. of America, was full of data of great significance to the automotive industry. In the first place, he showed that there are a number of weldable alloys of aluminum which lend themselves to economical fabrication into light-weight structures. Of the common, non heat-treatable materials, there is pure aluminum as well as an alloy containing 1¼ per cent magnesium. The strength of the structure depends upon the degree of cold work and in general runs from 11,000 to 15,000 lb. per sq. in. Failure of a weld under maximum loading will occur in the parent metal.

Of the heat-treatable alloys, the most commonly used for welding are 51S and 53S, which are prepared for use by the solution heat treatment and aging. The strength of these alloys is materially affected by heat treatment and reheat-treatment may be desirable after welding.

Welded aluminum structures have been widely used in the transportation field. In the automotive field, we find the following applications: 1. Milk truck tanks; 2. Gasoline truck tanks; 3. Light-weight trains; 4. Aircraft fuel and oil tanks.

For truck tanks, the 3S alloy is generally used, with welding rod of 2S wire. The welds are hammered flush with the metal. All seams and fittings are made with the oxy-acetylene torch. For light-weight trains, the 53S heat treatable alloy has been preferred. Either 2S or 3S alloy is used for aircraft tanks.

In these welded structures, the ductility is excellent as are the physical

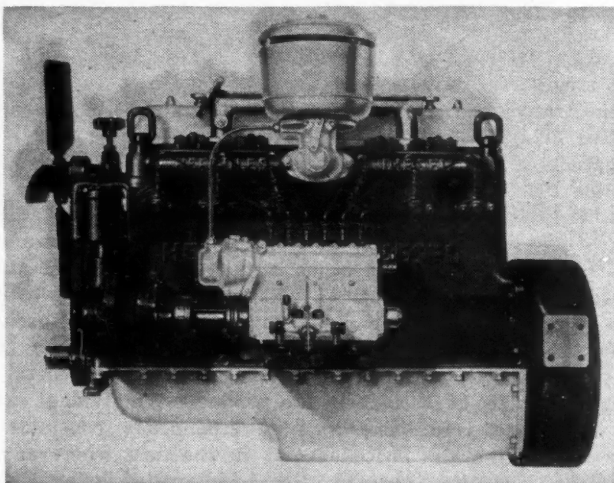
properties consistent with the application. There is, of course, a depreciation in tensile strength as well as in fatigue and impact properties of the heat treatable alloys at the welded areas.

In general, it may be said that aluminum welding is a practical process and one which is of great value in the automotive field. However, the welding technique must be acquired through practical experience rather than formula since the "feel" of the metal is largely the product of individual skill. The author recommends consultation with experts in the field wherever an organization is interested in exploring the practicability of aluminum structures for specific applications.



Diesels in Smaller Power Ranges

Hercules adds two lines, one rated at 79 hp. and one at 82.5 hp., for interchangeable mounting with gasoline types of comparable size



**Hercules Model
DJX engine,
injection-pump
side.**

AS another step in its program to have available a complete line of high-speed, six-cylinder Diesel engines paralleling in performance and installation dimensions Hercules gasoline engines of similar displacement, Hercules Motors Corporation of Canton, Ohio, announces the series DJX Diesels.

The smallest engine of this series, the DJXB, has a 3½-in. bore and a 4½-in. stroke (260 cu. in. displacement), while the DJXC has a bore of 3 11/16 in. and a 4½-in. stroke, giving it a 288-cu. in. displacement. The DJXB

is rated 79 hp., and the DJXC 82.5 hp. at an engine speed of 2600 r.p.m.

These are believed to be the smallest high-speed, heavy-duty Diesels offered by any American manufacturer at present. These DJX Diesel engines are interchangeable from an installation standpoint with the extensively-used Hercules JX series of gasoline engines, thus providing manufacturers the opportunity to supply either gasoline or Diesel engines in their equipment without any mounting complications.

The general design of the DJX series follows that developed by Hercules in its two larger Diesels, the DHXB 5 by 6 in., and the DRXB 4¾ by 5¼ in., including the patented auxiliary combustion chamber. This combustion chamber is located at the side of the cylinder bore, and the "throat" which connects the cylinder with the chamber is so designed that the piston on its approach to top center on the compression stroke gradually reduces the throat area, thus automatically increasing the velocity of air entering this chamber, at the time fuel is injected, insuring very thorough mixing of fuel and air.

The very rigid crankshaft is supported by seven bearings in a crankcase cast integral with the cylinders,

which crankcase also supports the four-bearing camshaft. Aluminum-alloy pistons are used; connecting rods are of heat-treated nickel-chrome-molybdenum steel, rifle drilled to provide pressure lubrication to the full-floating piston pins.

Particular attention has been given to the water jackets and water passages, and a large capacity centrifugal water pump is fitted. The fan is driven by a V-belt from a pulley mounted on an extension of the crankshaft.

Lubrication is by force feed, oil being supplied by a gear pump to all main, connecting-rod, and piston-pin bearings, and to the gear train, as well as the overhead valve mechanism. Splash or throw-off from the connecting rods lubricates the cylinder walls. An oil filter is furnished with the engine.

A plunger-type fuel pump is used, built with a vacuum-type governor as an integral part of the pump, and it is mounted on the same side of the engine as the fuel injectors, intake manifold, and air cleaners. On the exhaust-manifold side are mounted the lubricating-oil filter, water pump, generator, and starting motor.

The DJX engines were particularly developed for use in commercial vehicles and buses in the smaller sizes.

This series of Diesels is available also in a power-unit form, either fully enclosed or in the open type of assembly, such as used for pump and generator drives and industrial applications.

Each of the two engines weighs 825 lb. The maximum torque of the DJXB is 179 lb.-ft. at 1300 r.p.m. and that of the DJXC 187 lb.-ft. at 1300 r.p.m.

SUCCESSFUL Diesel engines of the size announced by Hercules present many problems of engineering. The present announcement has been awaited eagerly by truck manufacturers, one at least planning to announce the engines as optional equipment in standard chassis within the next three months.—Editor.

JUST AMONG OURSELVES

Figures That Say What They Mean

FOR a number of years it has been impossible to obtain for publication attendance figures on the National Automobile Shows and for most of the local shows held in the United States. In distinction to such a policy, the management of the British National Show at Olympia has made a practice of issuing to the trade exact attendance figures, even going so far as to subdivide them by days of the show week. AUTOMOTIVE INDUSTRIES finds much to commend in the latter policy.

Here are the attendance figures for the last show at Olympia, held in October:

Year	Total Attendance	Per Cent Change
1929	227,474	
1930	224,091	- 1.4
1931	186,773	-16.6
1932	185,778	- 0.5
1933	234,225	+26.0
1934	231,812	- 1.1
1935	232,670	+ 0.5

Isn't that a better statement of salient facts than the weasel words with which it is deemed necessary to camouflage inevitable fluctuations in the attendance at our own shows?

Our Ruins Rise In a Good Cause

FOREIGN visitors to the United States have been quoted often as saying that the tourist industry of the country must suffer because we have no picturesque ruins of the sort to be seen in most of the countries of Europe. In one particular such critics are wrong—we do have our ruins—and usually they are the vestigial remainders of some form of transportation facility which has been aban-

doned in favor of a faster method, a shorter route, a cheaper means of transporting people and goods from place to place. They remain as mute reminders that America moves, and that its destiny is rooted in transportation.

Something of this sort must have been in the mind of Thomas H. McDonald recently when, in a radio speech he remarked that transportation must be planned, but not on the assumption that existing facilities must be preserved. This is a dictum which bears writing above every desk in every automotive office in the United States. Thanks are due the director of the Bureau of Public Roads for giving it voice.

Slowly, by tortuous methods, the railroads are improving services and facilities to bring themselves into a better competitive relationship with motorized transportation. In many cases, the simplest way to do this is to put railroad capital into motorized - transportation facilities.

Whatever the eventual result of railroad efforts, by sponsoring legislation restrictive to motor transportation on many fronts, they have placed themselves clearly on the side of the "preservers" rather than the "promoters," so far as the public interest is concerned.

Under Federal regulation, common carriers in the trucking field are gradually removing the obstacles which have for years kept them from even wider public acceptance as a transportation facility. Classification of freight moved by truck is proceeding, and arrangements are being made for transfer of complete loads between trucking lines, by shifting trailers from

one tractor to another on an exchange basis. Fortunately, such arrangements for trucking lines can be made with commendable speed and flexibility. Motor-trucking is entering a new and more professional phase.

Wanted: Solution To Octane Puzzle

LAST week the Consumers Advisory Board in Washington took it upon itself to warn the motor-vehicle owners of the country that it was foolish to purchase premium fuels and pay extra prices for any gasoline just because it bore a familiar branding. The statement was made that few cars of the total registered require high-octane fuels.

The latter fact receives numerical support this week from the "First Progress Report of the Automotive Survey Committee," presented to the annual meeting of the American Petroleum Institute in Los Angeles. Says the report: "The proportion of cars requiring over 70 octane is extremely small, actually only 1.4 per cent of all registered. Even this small percentage is due almost entirely to a single make of poor combustion-chamber design. Of the 21½ million cars registered Dec. 1, 1934, 312,000 needed over 70 octane and 250,000 of the 312,000 were of the same make. Other cars of better mechanical design operate with perfect satisfaction on 68 octane fuel although having actually higher compression and giving better fuel economy."

Consumer and supplier seem to agree on the problem. Leaving aside what would happen to the consumer who purchased fuel from cat-and-dog pumps, there seems to be room for some genius to offer a suggestion as to how the petroleum industry (perhaps with the cooperation of the automotive manufacturers) shall see that each kind of vehicle gets the optimum fuel—at an economical price. Are there any takers? —H. H.



AUTOMOTIVE ABSTRACTS

Racer With Radial Air-Cooled Engine

A NEW racing car with radial air-cooled engine mounted forward of the front axle, and with front-wheel drive, has made its appearance in European contests. It was built for Count Trossi by two Italian technicians, Monaco and Aymini, who had previously built a small racer embodying somewhat similar principles.

The engine has eight double cylinders arranged radially. It is located forward of the front axle. This has the advantages that it places a large proportion of the total weight (75 per cent) on the front wheels and that it locates the center of gravity well forward, so that the car has a high degree of aerodynamic stability. The engine operates on the two-stroke cycle and there is a common combustion chamber for each pair of cylinders, which latter have a bore of 65 and a stroke of 75 mm. (2.56 by 2.95 in.). The total displacement is more than four liters. Each pair of cylinders is a single iron casting with detachable head. The joint surfaces of the block and the head are lapped so as to get a gas-tight joint without the use of a gasket. The general arrangement of the cylinders follows that employed in the Garelli motorcycle engine, the inlet ports being at the lower end of the rear cylinder and the exhaust ports at the bottom of the forward cylinder. The crankcase is machined up from duralumin. In spite of the high-grade material used for the crankcase, the cylinder heads and cylinders are held in place by eight long studs screwing into three steel disks which support the bearings of the crankshaft. The crankshaft is of the built-up type, having three parts, and is readily disassembled. It is supported in needle bearings, and the same bearings are used in the connecting rod head. The master rod and link-rod construction is employed. All of the moving parts are completely machined. The pistons are of aluminum alloy, heat treated, and were furnished by the Borgo Piston Co. Supercharging is effected under a pressure of 10 lb. per sq. in. by two Zoller vane-type blowers built in England. Two Zenith carburetors are fitted, fuel feed is by an A. M. pump and ignition by a Scintilla Vertex magneto. The drive to the front wheels is through constant-velocity universal joints which permit of a steering angle of 38 deg.—*Motor Italia*, September.

A Noise Campaign

A MOVEMENT to eliminate unnecessary noises has been under way in England for some years now and has engaged both the Government and the British Association for the Advancement of Science. At the recent annual meeting of the Association, a report was made by a Committee on Noise, and a recommendation was made that all new models of motor vehicles should be type-tested, to assure that they comply with certain standards of noise. The complaint has been mainly against motorcycles and sports cars. At the meeting of the Association last year it was shown that by the use of certain types of muffler developed at University College, Southampton, representative motorcycle engines could be satisfactorily muffled. To facilitate the introduction of effective silencers it was suggested that the Minister of Transport should set up an organization which would test each new type of machine, and if found

satisfactory, to issue a certificate of approval for it. The Minister of Transport has appointed a Committee to look into the whole question of transport noise, and definite action will be deferred until that committee makes its report. In the meantime a pair of mufflers based on the principles developed at University College was made for the Royal Automobile Club of Holland. The two were identical except for the fact that one was packed and the other unpacked. A careful comparison of the two showed that the unpacked one was slightly more effective. Motorcycle manufacturers, who sponsored this research work on mufflers, being satisfied that sufficient information on exhaust mufflers is now available, have made a further grant for the investigation of carburetor noise. A resolution was adopted by the Association in which it expressed the hope that the Minister of Transport would make an arrangement whereby new motor vehicles might be type-tested to insure that they complied with a certain standard of silence, even though that standard were originally a very lenient one.

In the discussion one member said he knew one of the largest manufacturers of sports cars who would be glad to reduce the noise, but if he did so he could not sell the cars. It was necessary to bring home to those who used them that they must do so with a lower level of noise.—*Engineering*, Sept. 13.

European Transcontinental Highway

A CONFERENCE was held at Budapest, Hungary, recently to discuss a proposed highway from London to Istanbul, to be called European Highway No. 1. The conference was called by the Hungarian Government. Its object was to coordinate the efforts of organizations in the various countries through which the highway will lead. It was stated at the convention that this was the first time in history that a number of nations collaborated on the construction of a truly international highway. Delegates were sent to the convention by the Governments of Great Britain and her overseas dominions, Belgium, Germany, Austria, Yugoslavia, Bulgaria and Turkey. The idea of the Transcontinental road was conceived by the Automobile Association of Great Britain in 1930, and espoused by the International Touring Alliance. The whole route has been surveyed by the Automobile Association. It is intended that the highway eventually shall become the nucleus of a system of trunk roads across Asia to Calcutta and across Africa to Capetown. A good deal of construction work has been done on the European section already. It is intended that the roads built shall be available for all forms of traffic and not merely automobile speedways.

Clutch and Accelerator Pedals Combined

A NEW clutch control was shown at the Paris automobile show by the German Hanomag concern. The clutch pedal is combined with the accelerator pedal. By means of an extra linkage, the accelerator pedal controls an oil-pressure line connected directly at the oil pump of the engine. Disengagement of the friction clutch is effected by means of the oil pressure. When the driver wishes to shift gear he removes his foot from the accelerator pedal, which at the same time automatically releases the clutch. After the shift has been made and the accelerator pedal is pressed

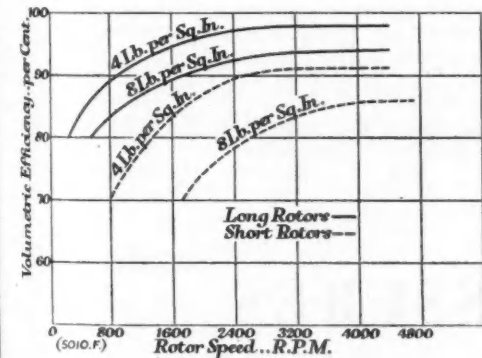
down again, the clutch is automatically engaged again. A writer in *A.T.Z.*, from which publication we take this item, considers the plan very promising, especially since the control has been so worked out that it permits of using the engine as a brake on down-grades.—*A.T.Z.*, Oct. 25.

Gasoline Dope

THE same as in other countries in which automobiles are being used extensively, there have appeared repeatedly on the German market so-called addition agents which when added to or dissolved in gasoline, are claimed to increase engine power and reduce fuel consumption. Persons familiar with the chemistry of the petroleum hydrocarbons naturally are skeptical as to the efficacy of these addition agents, and Wa. Ostwald, publisher of the *A.T.Z.*, on two different occasions has conducted a campaign against the marketing of these "power pellets." The subject was brought up at a recent joint meeting of the German Society for Petroleum Research and the Internal-Combustion Engineering Society, and the following resolution was unanimously adopted: "The joint meeting of the German Society for Petroleum Research and the Internal Combustion Engineering Society does not know of any secret media which result in a reduction in fuel consumption and advises against the use of such media."

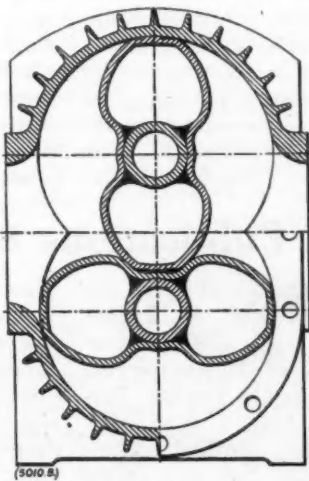
New Supercharger of Roots Type

A SUPERCHARGER of the Roots blower type has been placed on the market in Great Britain by Marshall Drew and Company of London. For high pressures and high speeds, steel rotors are employed, made from solid-drawn tubing accurately ground to involute form. The tips of the rotors are grooved to improve the sealing, and the



Delivery characteristics of the blower

Marshall Drew blower in longitudinal and transverse sections



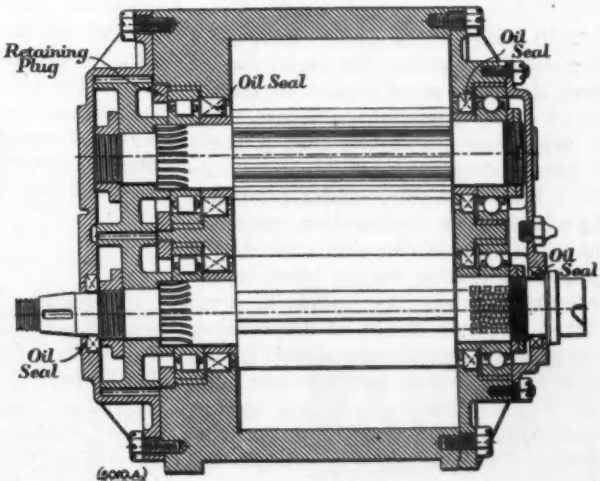
ends are closed by plates welded in place. The rotors are mounted on hollow shafts of high-tensile steel, to which they are electrically welded along four lines. They are mounted in ball and roller bearings and driven by a pair of very accurate spur gears, the maximum backlash in which is only 0.0005 in. The centering of the shafts is accurate within 0.00025 in. The bosses of the gear wheels are cut with splines which mesh with splines on the rotor shafts, and the spacing of the two sets of splines has been so chosen as to give a vernier adjustment of the rotors, which must be accurately at right angles. The body of the supercharger is made of either aluminum or magnesium alloy. The supercharger illustrated herewith has over-all dimensions of 9 by 8 by 5 in. and it is capable of handling 59 cu. ft. of free mixture per minute, against a pressure of 5 lb. per sq. in. when turning at 3000 r.p.m. A unit of this size would be suitable for supercharging an engine of 52 cu. in. displacement and would increase its power from 35 to 75 b.hp. at 5500 r.p.m. One of the illustrations reproduced herewith shows sectional views of the blower, while the other shows the variation of the volumetric efficiency with speed. The normal clearances between casing and rotor are 0.003 to 0.004 in. The gears are lubricated from the engine lubrication system, while no lubrication is required by the rotors.—*Engineering*, Sept. 6.

Six New Diesels

SIX different designs of high-speed Diesel engines are under development in the U.S.S.R., and Professor N. R. Brilling in an article in the Soviet publication *Motor* states that the principal problem of the motorcar and tractor industry under the second five-year plan consists in the "Dieselization" of commercial motor vehicles and motor tractors. All six engines were designed by the Scientific Auto-Tractor Institute (N.A.T.I.) during 1934. The six models may be briefly described as follows:

- Model MX, four-cylinder, four-stroke, 4½ by 6 in., 42 hp. at 1100 r.p.m., 38.5 lb. per hp.
- Model ATB, three-cylinder, two-stroke, 5.90 by 7.87 in., 60 hp. at 650 r.p.m.
- Model KODJU, six-cylinder, four-stroke, 4.53 by 6.30 in., 90 hp. at 1600 r.p.m., 15.1 lb. per hp.
- Model M-VII, four-cylinder, four-stroke, 4½ by 6 in., 55 hp. at 1400 r.p.m., 25.6 lb. per hp.
- Model M-XII, six-cylinder, four-stroke, 4 by 4.75 in., 70 hp. at 2000 r.p.m., 14.3 lb. per hp.
- Model M-XIII, four-cylinder, four-stroke, 6.5 by 8.5 in., 100 hp. at 1000 r.p.m.

All of the engines are of the precombustion-chamber type except the KODJU, which has direct injection. The nominal horsepower in all cases is lower than the maximum



given, and usually is obtained at a lower speed. The compression ratios of the six engines and the corresponding b.m.e.ps. are as follows:

Engine	MX	ATB	KODJU	M-VII	M-XII	M-XIII
Compr. Ratio	17.5	...	16.3	17	17	17.5
B.M.E.P.	89.5	56.8	72	89.5	77	...

The MX engine, of which three were built in the Kharkoff Tractor Works, was run for 600 hours in the laboratory without serious defects developing, and it has also been run for 110 hours in a Kharkoff tractor. The exhaust is entirely smokeless both under load and when idling. After a revision of the design, 25 of these engines were built by the Tractor Works. Further development work is being done on the engine with a view to assuring more reliable starting in cold weather, improvement in materials, reduction of the injection pressure, and improving the adaptability of the engine to the tractor.

The ATB was originally built for installation in a tractor of the Caterpillar 60 type, and the designers aimed at the horsepower, speed and weight of the original engine. Work on this engine was started in October, 1932, and this was the first high-speed Diesel engine built in the U.S.S.R. It was built at the Red Proletarian Works without the use of foreign materials and parts. The engine is of the two-stroke type and the scavenging ports cover 25 per cent of the length of stroke. A separate scavenging pump was provided for each cylinder. Injection control was effected by means of tapering cams. When the engine is to be started with compressed air, one of the cylinders is used as an air compressor to compress air for starting to a pressure of 400 lb. per sq. in. Cylinders are relieved of gas-pressure stresses by "through" bolts. One advantage of this engine is that it runs satisfactorily on a wide variety of fuels. Starting can be readily effected at temperatures down to 41 deg. F. with a pressure in the air reservoir of not less than 180 lb., glow plugs being used as a starting aid. After 70 hours test, mostly at full load, the engine was declared ready for production after a few changes that had been suggested by the tests.

Among the most satisfactory of Soviet Diesel designs is the KODJU, a product of the Bureau of Special Designs, of which two were built in 1933 and installed in Yaroslavl 5-ton trucks. These two engines had run 2200 miles each at the time of the report. The engine has an aluminum cylinder and crankcase block, with inserted steel liners. There are seven main bearings on the crankshaft, and the seven duralumin bearing caps are held in place by "through" bolts

extending through the cylinder head. Both the flywheel housing and the timing-gear housing also are aluminum castings. Bosch injection equipment is used, together with a 6 hp. 12-volt electric starter. Electric glow plugs are used as an aid to starting. The engine has a displacement of 610 cu. in. and the Yaroslavl 5-ton truck weighs 11,300 lb. empty. The maximum speed of the truck with the engine running at 1600 r.p.m. was about 25 m.p.h. An output of 60-65 hp. was obtained at 1100-1250 r.p.m., with a specific fuel consumption of 0.425-0.435 lb. per hp-hr. The form of the combustion chamber is said to be such as to make starting quite reliable even at low temperatures. This design is still in the experimental stage and is being further developed by the N.A.T.I. prior to being placed in production.

The M-VII engine is being built by the Stalingrad Tractor Works for installation in the new medium-size crawler tractor of that plant. The first two of these engines were completed in 1933, but tests are still being conducted jointly by the N.A.T.I. and the manufacturers, with a view to eliminating certain defects. When this has been achieved, the engine will be subjected to extensive laboratory and field tests prior to being placed in production.

The M-XII engine also was built by the Stalin Works, but the first four failed by reason of cracks developing in the cylinder castings. A number of additional engines were built during the latter part of 1933 and subjected to test. After a run of 100 hours it was found that the white-metal lining of the main bearings showed signs of being squeezed out, the crankshaft showed scratches, and the lubricating oil pump was found to have insufficient capacity. It was decided to change the material of the crankshaft so its journals could be hardened. These changes are being made at present.

Model M-XIII was built by the Cheliabinsk Tractor Works for installation in the crawler tractor Stalinetz 60. The design, which was completed in August 1933, was based on that of the carburetor-type engine which originally powered this tractor, but the crankshaft and connecting rods were strengthened to bring the whole design into line with foreign Diesel engine practice of the period. The engine can be started either by means of an air starter or the Heywood type or by means of an electric starter. No changes were required in the tractor chassis to accommodate this engine. The first three experimental engines of this type were completed in 1934 and after exhaustive laboratory tests the design was passed for mass production—*The Automobile Engineer*, September.

PRESSWORK PRESSURES

Presswork Pressures, by C. W. Lucas.
Published by McGraw-Hill Book Co., Inc.,
New York.

THIS book is intended to serve as a guide in selecting the right size of press for any given job. The author first felt the need for such data some 20 years ago and found that it could be obtained only by making tests. So about 1,000 tests were conducted, differing with respect to operation, material, shape, and size of the piece. Where the speed of operation has no effect on the pressure required the hydraulic press offered a speedy means of determining the pressure. The ram speed of the hydraulic press was only 7 ft. per min., and where higher speeds are used a suitable allowance must be made. Another method used to determine the maximum pressure of the pressing op-

eration involves the use of standard copper blocks, which are used between the two bolster plates placed below the dies. When the press is tripped, the blocks are mashed in accordance with the maximum pressure exerted. The degree of mashing is measured and the pressure exerted is calculated from standard test data. The book is got

up in the form of data sheets, with diagrams of the operation and captions or explanatory notes referring to the diagrams. There are nine chapters, covering coining, drawing, embossing, forging, forming, hook seaming and curling, punching, shearing, hollow cutting, and sprue cutting, riveting and miscellaneous operations, respectively.

Publications Received

Proceedings of the Twenty-first Annual Road School, held at Purdue University, Jan. 21-25, 1935. Extension bulletin No. 35 of the Engineering Extension Department, Purdue University, Lafayette, Ind.

Aviation Training. Revised edition. Aeronautics Bulletin No. 19.—United

States Government Printing Office, Washington, D. C.

A.S.T.M. Standards on Petroleum Products and Lubricants, prepared by Committee D-2 on Petroleum Products and Lubricants. Published by the American Society for Testing Materials, Philadelphia.



A section of the new 500-ft AC assembly line where spark plugs are assembled. A detailed description of the operation will appear in an early issue of *AUTOMOTIVE INDUSTRIES*.

PRODUCTION LINES

Affects Cooling

Specialists see a lot of things that we ordinary mortals don't. Take for instance those beautiful radiator grilles that we find everywhere for 1936. One of our friends, a radiator engineer, tells us that the restriction to frontal air flow on some of these jobs is almost equivalent to removing the fan on an older car. New grilles have brought fresh headaches to radiator designers. But there are allied problems, according to our informant, not the least of which is the fact that under-the-hood temperatures also go up and protection against vapor locking may become inadequate. The answer—well, it doesn't mean that the new grilles have to be scrapped but it does mean that something should be done to permit the flow of more air to the radiator. This can be done by changing the grille pattern in some suitable fashion.

Zinc Alloys

If there still be some who are not sure about the properties of the new zinc alloys for die castings, we refer them to a new handbook on Zamak Alloys, just off the press. This research bulletin has been prepared by Anderson and Werley of the New Jersey Zinc Co. It should be of vital interest to metallurgists, engineers, and production men, since it covers all aspects of the die-casting art—metallurgy, properties, finishing, machining, etc. It's new and should be a part of your office library.

Visual Report

We are willing to gamble that you couldn't name off-hand all the places where zinc alloy die castings are used in automobile construction. For you and for me, New Jersey Zinc has fixed up a book that's a veritable picture gallery

of die-casting applications not only on automobiles but in many other industries. This material may hold some valuable tips for you in your own operation.

Radical Designs

Judging by the comments of leading engineers at the first Detroit Section meeting of the season, some are not so keen about radical moves in car design, particularly such things as rear engine drive or true streamlining. As a matter of fact, the engineer will tell you that at present we have no such thing as streamlining in the scientific sense of the term. We have something better, however, when you consider the smooth body lines, sloping fronts and back panels, decreased frontal area, and the ever increasing tendency to clean up exteriors.

Arc Welding

A new combination catalog and data book on electrodes and accessories for arc welding is being distributed by Lincoln Electric Co. To many people in various quarters of the industry, this will be of more than passing interest.

Saves Money

You'll be interested in this story about an unusual application of a Thompson-Gibb butt welder. As we get it, a certain parts maker built an expensive forging die for producing a clutch release yoke. After several thousand forgings had been struck off they found that one arm of the yoke was several degrees out of line. What to do? Well, that's where the butt welder comes in. Forgings were clamped in the welder, using a simple die to take care of the alignment, heated to 1200-

1500 deg. F., and then bent to form in the die. This device not only saved the day but it developed a method of using a single forging die for producing a family of forgings. Surely it's an ill wind that doesn't blow some good!

New Rear

We had a demonstration, the other day, of a new articulated rear axle giving the effect of independent suspension without mechanical complications. Its construction follows conventional design. The differential carrier is bolted to a cross-member, the drive shafts have universals at the differential end and are housed within articulated axle tubes. While this construction is not designed for particularly large spring deflections, it does take care of wheel camber on crowned roads and in taking heavy turns.

Getting Smaller

Portable spot welders are getting smaller and smaller. If you are familiar with what Pete Fassler is doing, you will get what we mean. A prominent research man in the welding field told us the other day that still smaller units may be built if higher frequencies are adopted. Some day, in the not too distant future, we may see production spot welders not much bigger than a small portable drill, taking power from an overhead line.

Stepped Up

Developments in accurate timing of resistance welding promise some revolutionary economies in spot and projection welding work. One of the outstanding organizations in this field estimates that within a short time, productivity may be stepped up to 1500 spots per minute. And this will be done with improvement in quality.

—J. G.



Automotive Industries

November 23, 1935

NITRIDED CYLINDER LINERS

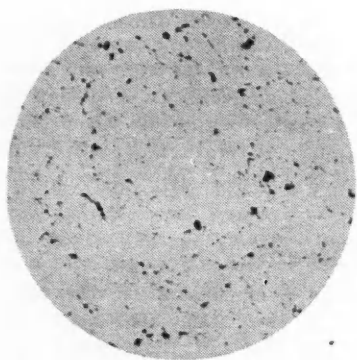


Fig. 1—Section of core material, unetched



Fig. 2—Section of core material, etched

head installation, abrasion by the rings or failure of lubrication. To minimize wear, it is necessary that the cylinder present a surface of great hardness; it should not distort appreciably in service, and it should be corrosion-resistant to a fair degree.

Various materials have been tried for cylinder liners, and of the ordinary materials a hardened chrome-nickel iron has proven best. The material has a Brinell hardness of about 500, and the liners can be rebored in the block a num-

NITRICASTIRON is a special grade of iron which is nitrided on the surface of the bore. The hardness ranges between 800 and 1000 Brinell and extends to a depth of 0.004 to 0.006 in. The analysis of the iron is as follows:

Total Carbon	2.93
Graphitic Carbon	2.31
Combined Carbon62
Phosphorus058
Sulphur029
Manganese76
Silicon	2.69
Chromium	1.28
Vanadium16
Molybdenum24
Aluminum	1.01

THOMPSON PRODUCTS, INC., of Cleveland, Ohio, is introducing in this country the cylinder liners of nitricastiron which have been used on a small scale abroad for a number of years.

The use of removable liners, of both the dry and wet types, has increased considerably in bus and truck engines of late, the reason being that the life of cylinder bores in ordinary gray iron blocks in heavy-duty service is no longer satisfactory. With ordinary gray iron blocks an overhaul is often necessary after 25,000 to 30,000 miles of hard service. With liners of alloy cast iron, heat treated, the mileage before an overhaul is required has been increased to 75,000 to 200,000 miles, while tests with nitricastiron liners indicate that these will stand up for from 300,000 to 400,000 miles before any service operations are needed on the block. Pistons and rings will have to be replaced during this period, depending on operating conditions, but the block itself requires no attention.

Cylinder wear is due to a number of causes, including corrosion, deformation due to high gas pressure or improper

ber of times for oversize pistons and rings.

The great hardness of the liner reduces to a minimum the wear from the various causes listed in the foregoing. However, bores of great hardness result in high oil consumption, if the ring installation is not properly made. Experience to date indicates that "dead" rings with expanders behind them are best under these conditions, this applying to both the compression rings and the oil rings. There is said to be very little friction loss with such an instal-



Fig. 3—Section of outside surface, showing nitrided surface and portion of core

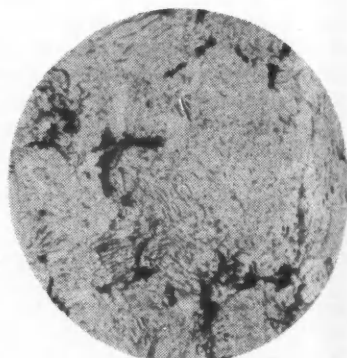


Fig. 4—Section of nitride case

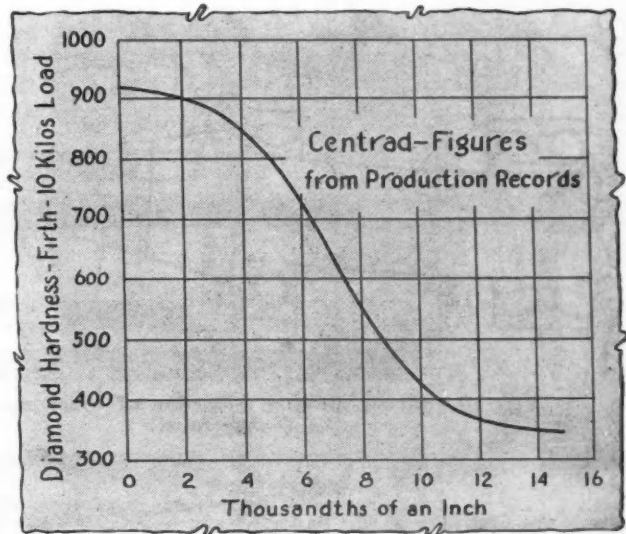
— Of 800-1000 Brinell Hardness Range Being Introduced in U. S. by Thompson Products, Inc.

lation, as the coefficient of friction between the ring and the hard nitrided surface is very low. In some installations the rings have been tin-plated, and this gives a good seal immediately, where ordinarily it takes some time for the rings to become properly seated. With the special installation mentioned above, the oil consumption is quite satisfactory right from the beginning.

These cylinder liners are made from castings produced by the centrifugal process. As taken from the mold, the casting weighs from 12 to 15 lb., while the finished liner weighs only about 3 lb. The reason so much metal is machined away is that it is desired to use in the liner only the dense, sound material of the interior of the casting. After machining the liners are tin-plated on the outside surface, to prevent nitriding of this surface. They are then nitrided at approximately 950 deg. F. for 65 hours in a conventional nitriding furnace. A case extending to a depth of about 0.015 is obtained, the hardness tapering off with depth as shown in Fig. 5.

It will be seen that the outside of the case is the most desirable portion. For this reason very little material should be honed away after installation. Field experience indicates that a total of 0.002 in. honing will clean up practically all distortion. After the nitriding there is a "nitride fuzz" on the surface, which, however, is removed before the liners

Fig. 5—Diamond hardness of case as a function of the depth



are shipped. Much of the distortion generally disappears when the liner is pressed into the block. To minimize distortion, in a six-cylinder engine the liners should be installed in the following order: 1, 3, 5, 2, 4, 6.

Nitriding produces a small growth, varying with the diameter and thickness of the liner. This may be as much as 0.001 in. and is allowed for in the bore. Liners are assembled with a press fit of from 0.0015 to 0.0025 in., depending on the bore. To facilitate the installation,

the outside may be coated with linseed oil. Heating the block in boiling water is a help, and chilling the liners in dry ice further reduces the pressure required to get the liners into place. It is stated, however, that in repair shops the liners can be installed without these expedients.

With liners of such great surface hardness, practically all of the wear in service occurs on the moving parts, which results in a saving when reconditioning the engine.

New Book on Diesel Engines

Diesel Engines by J. W. Anderson. Published by McGraw-Hill Book Co., 330 West 42nd Street, New York, N. Y.

THIS is a new book on Diesel engines in which these engines are classified according to application. The book seeks to picture the Diesel engine as it is today in the United States. As most of the engines built in this country are of the larger, stationary and marine type, the emphasis naturally is

on these, but there are also chapters on automotive engines, aviation engines, railway engines, etc. The treatment is mainly descriptive. In addition to the chapters on the different applications there are also chapters devoted to design details and such accessories as governors and safety equipment, cooling and water-cooling systems, lubrication and lubricating systems, and on installation, operation and

maintenance, performance and cost of operation. The book contains also a chapter on fuels and fuel systems, but it is rather surprising that no mention is made in this of the cetene-number system of rating Diesel fuels although the Diesel-index system is mentioned. The book is well illustrated and gives a good picture of the Diesel engine industry of the United States and its products.

FACTORS INFLUENCING SPIRAL - BEVEL GEARS

by J. D. Almen

Head, Dynamics Section, Research
Division, General Motors Corp.

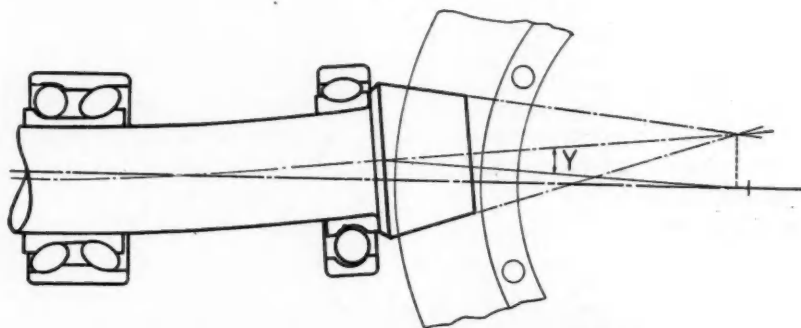


Fig. 10—Sketch showing deflection of overhanging pinion (exaggerated)

IN the first part of this paper, which appeared in *AUTOMOTIVE INDUSTRIES* of November 16, the authors described tests on rear-axle gears which led them to the conclusion that gear-tooth failure in service is due to fatigue. The discussion of the results obtained is here continued.

Fig. 10 shows an exaggerated sketch of deflection of an overhung mounted pinion under load, and the stress concentrating effect of such deflection on the contacting teeth. Although the sketch shows a ball bearing mounting, the results are the same for other forms of anti-friction bearings. Theoretically, the apex of the pinion cone coincides with the cone apex of the gear. This ideal condition does not prevail in practice, inasmuch as all parts of the gear assembly are deformed when load is applied. The pinion-bearing deformations are such as to shift the pinion axis through an angle which tends to localize the tooth loads at the heel of the teeth. A measure of this concentration is the angle Y, Fig. 10. Deflections in other directions are less serious in effect, since they do not result in as serious shifting of the load lengthwise of the teeth. Where space permits a better pinion support can be obtained by the use of straddle mounting. With this arrangement of bearings, it is theoretically possible to completely compensate for angular deflections, as shown in Fig. 11. If the rigidities of the two bearings are inversely

proportional to their distances from the pinion apex, deflections of the pinion bearings under load will merely result in the pinion rotating about its apex. In practice, it would be necessary to overcompensate to allow for the deflection of the ring gear assembly and its supports. This means that the forward bearing of a straddle mount should have high radial elasticity and that the rear bearing should be highly rigid.

Fig. 12 shows the results of a series of tests made to determine the relative deflections of several pinion bearing combinations used in production automobiles. The heights of the bars are the measure of angular deflections for forward and for reverse drive, for each of the bearing types illustrated. The load applied was the resultant force corresponding to maximum low-gear torque, and was the same for all bear-

ings. The tests were made on new bearings having equal capacity ratings and fitted in accordance with the tolerances specified by the manufacturers. The solid bars show the angular deflection readings obtained with bearings fitted to maximum shaft and housing tightness; the open bars show the difference between tight and loose fits according to the manufacturers' tolerance limits. The data shown are corrected for pinion-shank deflections.

The angular deflections found for the straddle-mounted pinions shown in Fig. 12 are small when compared to the deflections of overhung pinions, as would be expected from the deformations shown in Figs. 10 and 11. For complete compensation, however, the angular deflection of the pinion should be negative, that is, the pinion apex should fall below its original position (Fig. 11) as the pinion rises under load since the ring gear apex moves downward due to deflection of its supports. This can be accomplished by increasing the radial deflection of the forward pinion supports.

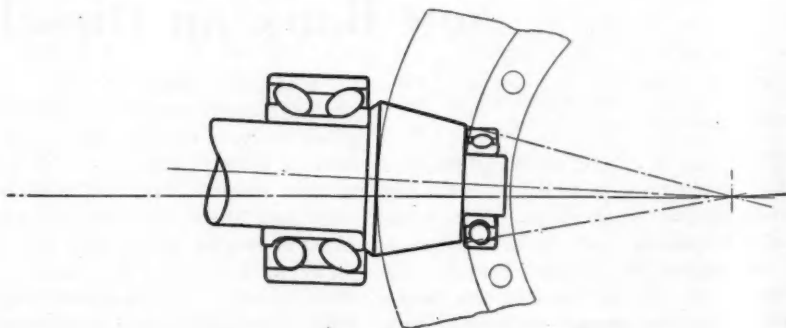


Fig. 11—Straddle-mounted bevel pinion

THE DURABILITY OF FOR AUTOMOBILES

Part 2

Part 1 appeared
in the November 16 issue of
AUTOMOTIVE INDUSTRIES

Economic considerations do not always justify the adoption of straddle-mounted pinions. Reduction of stress concentration in overhung pinions through the use of preloaded bearings, smooth fillets, reduced warpage, etc., permit the use of relatively small gears. The additional potential saving in size and weight that accompanies controlled elasticity can often not be realized because of design limitations, such as the available space between the pinion and the differential case.

In spiral bevel gears, the effect of deflection in the direction of the pinion axis is to partially compensate for angular deflection. Deflection in the direction of the ring-gear axis results in contact errors of the same kind as result from angular deflection, but of very much smaller amount.

The method used by General Motors Research Division for calculating gear-tooth stress assumes that the entire gear load is applied to one tooth only, notwithstanding the fact that several teeth may theoretically be in contact. Load concentration at the large ends of the teeth resulting from deflection of the kind illustrated in Fig. 10 reduces the overlap of the teeth, which, together with spacing errors, is sufficient to completely destroy the theoretical load distribution.

Photographs Taken While Gears are Running at Constant Speed

A part of normal routine in our gear testing is the photographing of the tooth-contact patterns of all gears tested. Photographs are taken while gears are running at constant speed under constant load, by means of a neon-lamp stroboscope. The rear axle is installed as shown in Fig. 1, with the back cover

plate removed. The axle is brought up to speed and load. A neon lamp of special form is flashed in time with the gear teeth, by means of a cam on the input dynamometer which has as many lobes as the pinion has teeth, with the result that the gears appear to be stationary. The teeth are then sprayed with a specially prepared, quick-drying paint, which dries before reaching the point where the gears are in mesh. This paint must not only cover the teeth and dry quickly, but must also possess lubricating qualities, since the gears must be free from oil during the photographing process. As the ring-gear teeth come into contact with the teeth of the mating pinion, the paint is wiped off in the contact region, giving sufficient color contrast to enable

pictures to be taken with an ordinary camera. As shown in Fig. 13, photographs are made under four loads, corresponding to a light driving load, full engine torque in direct drive, full engine torque in second gear, and full engine torque through low gear. Note that at light load the gears made contacts well toward the small ends of the teeth, and that as the load was increased, the contacts shifted toward the large ends of the teeth and away from the small ends. This is what would be expected from deflections of the kind shown in Fig. 10 and from the fractures shown in Fig. 9. These photographs measure the combined effect of deflections in all directions, as well as runout of all kinds.

To obtain this information by the

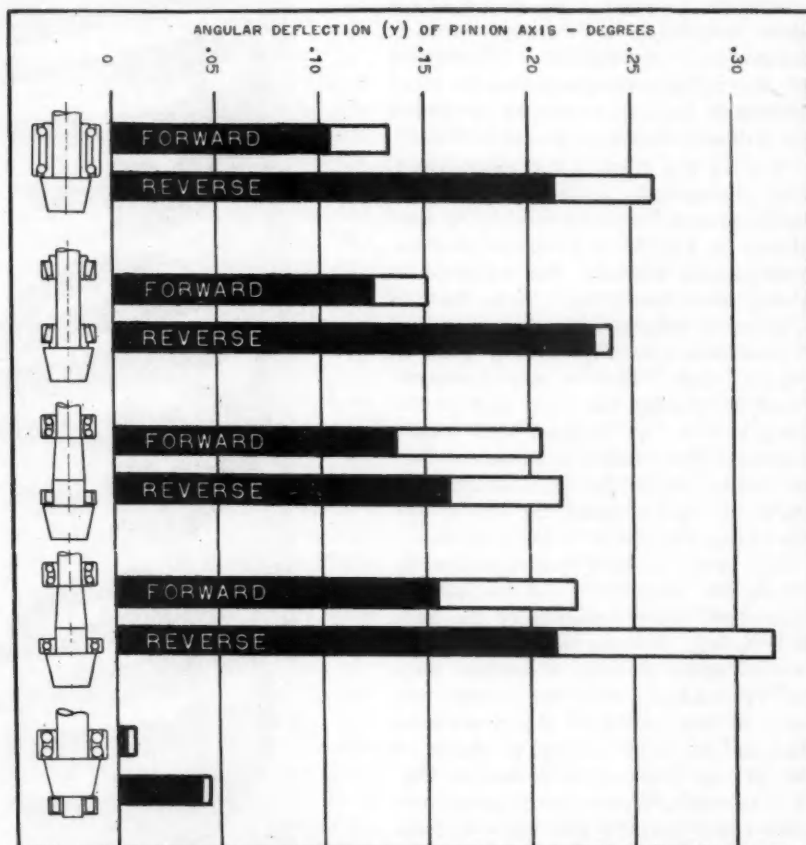


Fig. 12—Results of a series of tests made to determine the relative deflections of several pinion-bearing combinations

use of indicators is difficult, if not impossible. It has been shown that the most important measure of deflection in rear-axle gears is the relative position of the gear apexes. Separation of the apexes in the vertical plane is shown to be bad. Separation of the apexes fore and aft has a partial compensation effect on vertical apex separation. Apex separation in line with the ring-gear axes has relatively small effect. It is difficult to determine the movement of the apexes by indicator measurements. Furthermore, tooth contact conditions as affected by runout of the gear teeth due to warpage in heat treatment, or to wobble or eccentricity of the tooth cutting relative to other machined surfaces, can not be found by ordinary indicator measurements.

Fig. 13 (b) shows a set of tooth-contact photographs made from a gear identical in every respect with the gear shown in Fig. 13 (a), except that the gear-cutting machine was adjusted to give greater toe contact. Note that the shifting of contact with increasing load is less severe in Fig. 13 (b) than in Fig. 13 (a). This is most apparent when comparing the light-load photographs and the highest-load photographs. The reduction in stress concentration following the altered machine setting increased the life of the gear from 104,000 to 264,000 cycles.

Reduction of load concentration by setting the machine to cut toe contact is limited by the tendency of the gear to be noisy. Partial compensation for the inevitable shifting of contact with load is accomplished by cutting the teeth of the pinion to a spiral curve that differs from the spiral curve of the mating gear, as is shown in Fig. 14. The smaller curvature of the pinion-tooth curve permits this tooth to rock on the greater curvature of the gear tooth as the angular deformation varies. If these radii were equal, it is evident that the slightest angular deformation would shift the load from one end of the tooth to the other, with consequent high stress concentration. The greater the angular deflection, the greater must be the difference in radii of the teeth of the two mating gears, but this also leads to greater load concentration, since it limits the useful length of the teeth. Obviously, improvement would follow reduction in angular deflection permitting less difference in the radii of the teeth and thus producing more uniform stress distribution.

Photographs of the type shown in Fig. 13 are satisfactory for routine estimates of deflections and resulting load concentrations. They are quickly made and easily interpreted, and in the General Motors Research Laboratory they have supplanted the old

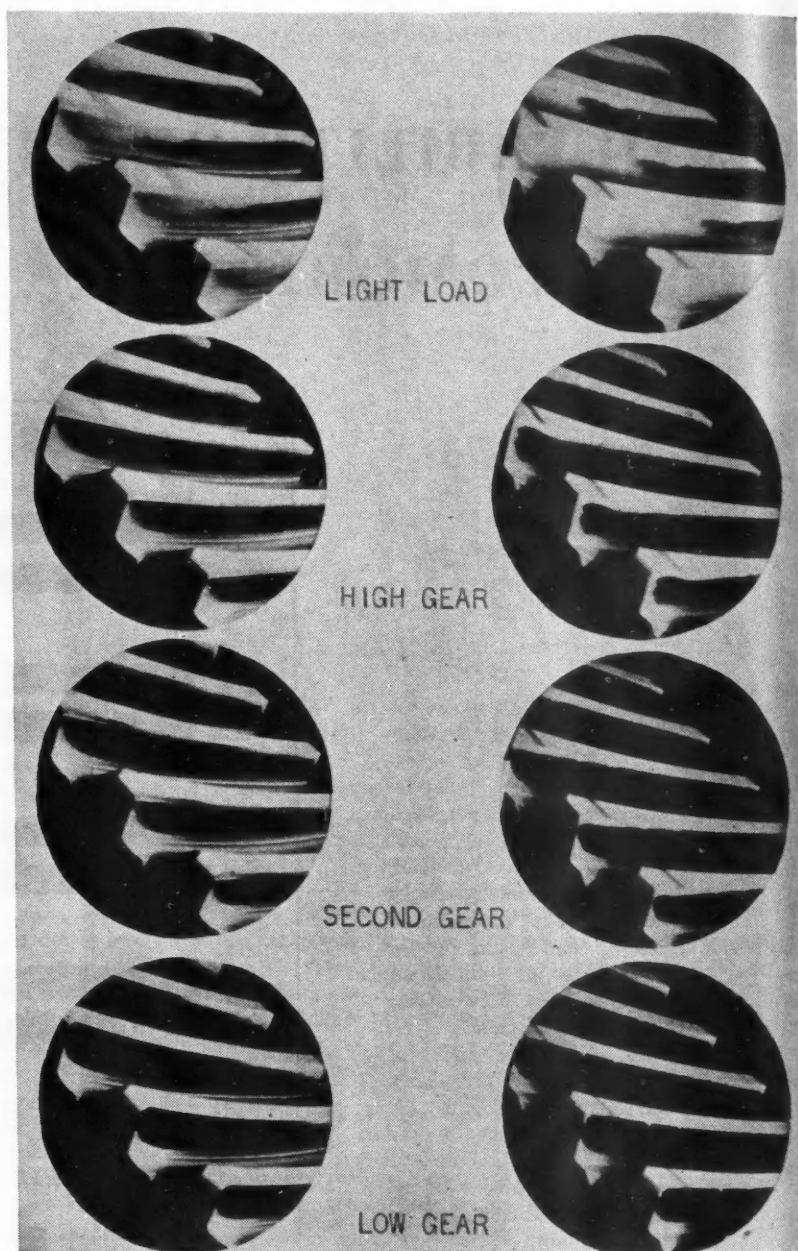


Fig. 13—Photographs are made under four loads

method of deflection measurements by indicators. This method, however, does not permit quantitative measures of load distribution. For this purpose, in one case, a series of etching tests was made by applying a static load equal to second-gear torque on an assembled axle and etching the surfaces of the gear teeth by passing sulfur dioxide and water vapor through the axle housing for a period of 30 hr. The areas of the gear teeth in actual contact were not etched, and it was, therefore, possible to measure the extent of the contacting areas. From these measurements and the known curvature of the teeth, it was possible to calculate the actual compressive stresses and the distribution of load, which were checked

against the applied load and found to agree within about 10 per cent. The tests were repeated a sufficient number of times with slight changes in the phase relationship of the gears to construct a plot of load distribution over the face of the teeth.

Fig. 15 shows, as a composite of the loads on the three teeth in simultaneous contact, the qualitative distribution of load along the pitch line of the pinion tooth. The load concentration at the heel (large end) of the tooth is clearly indicated; likewise, the fallacy of rating gear-tooth loads in terms of the length of the tooth face. The biased distribution of load would be even more pronounced under maximum low-gear torque.

Stress Distribution Between Pinion and Ring Gear

An important consideration in the design of spiral bevel gears is the proper proportioning of stress between the two mating gears. As stated previously, the permissible calculated stress in the pinion teeth has been found to be approximately 42,000 lb. per sq. in., equivalent to 100,000 stress cycles. The permissible calculated stress in the ring gear has, by these same tests, been found to be 62,000 lb. per sq. in. With this stress distribution, either the pinion or ring gear would be liable to failure by fatigue. The higher permissible ring gear stress is due in part to the fact that automobile rear-axle gear ratios are on the order of four to one and, therefore, each ring-gear tooth is stressed only one-fourth as often as the pinion tooth. The required minimum life of the ring gear, therefore, need be only 25,000 stress cycles, which corresponds to approximately 51,000 lb. per sq. in. (see Fig. 3). The balance of the permissible stress discrepancy, that is, the difference between 51,000 lb. per sq. in. and 62,000 lb. per sq. in., appears to be due to lower stress concentration in the ring-gear teeth, probably as a result of less severe cutter scratches.

Pitting

Surface pitting occurs in regions subjected to repeated high compressive stresses, and is a common form of gear failure. In automobile spiral bevel gears, pitting starts just below the theoretical pitch line of the pinion near the large ends of the teeth, and progresses toward the small ends of the teeth. In tests run at maximum low-gear torque, minute pits begin to appear after approximately 150,000 cycles of the propeller shaft and increase in size and number with continued running. However, pitting is not serious even after 2,000,000 cycles, which is far beyond the life requirements of the gears. In spiral-bevel truck gears, pitting may sometimes cause trouble due to the greater life requirements. Final failure in such cases is usually tooth

breakage, but pitting aggravates stress concentration in the region where stress concentration is already serious.

The etching tests described above supplied data from which it was possible to calculate the unit load between the gear teeth by the Hertz method. These tests showed that pressures of the order of 300,000 lb. per sq. in. are reached under second-gear torque. The maximum pressure occurs some distance below the theoretical pitch line of the pinion and corresponds with the location of initial pitting.

If pitting is due to compressive fatigue of the tooth surface, it follows that the pitting tendency is at a minimum when the load is uniformly distributed over the teeth. Stress concentrations, due to deflections, warpage, runout, etc., promote pitting, as well as reduce the resistance to breakage. There is, however, considerable evidence indicating that gear-tooth pitting in these and many other cases is not caused by compression fatigue. The fact that pitting starts at a point below the theoretical pitch line may simply mean that the actual pitch line, under the conditions of operation, does not coincide with the theoretical pitch line. It is also noted that as the pits spread toward the small ends of the teeth, they follow a line parallel to the theoretical pitch line and do not follow the line of maximum unit pressure. Furthermore, when the pits first appear, they are of very small size, requiring considerable magnification for satisfactory observation. Once started, these small pits rapidly increase in size through breakdown of the side walls of the

original pit. Pits due to compression fatigue should be of relatively large size on first appearance.

In dynamometer durability runs on automobile transmissions, it sometimes happens that pitting develops in gears that carry no load, such as the small reverse idler.

It is possible that a form of pitting may result from corrosion. It is well known that ball and roller bearings are subject to "corrosion brinell"; that is, the contacting surfaces become indented when the bearings are given slight motion while under load, even though the load is far below that required for true pressure indentation. When automobiles are shipped long distances in freight cars, it is usually found that the wheel bearings are slightly indented due to the small wheel motion resulting from the vibration of the freight car. "Corrosion brinell" is also common in automobile kingpin bearings, valve-rocker-arm bearings, and the like. Gear action at and near the pitch line appears to offer all the conditions necessary for "corrosion brinell."

We do not have sufficient data on the effect of materials on pitting in carburized gears to be conclusive. Tests have shown a tendency toward increased pitting with increased depth of case, but because many variables introduce load concentration, these data must also be accumulated from a larger number of tests before a definite trend can be established.

Scoring

The type of gear-tooth wear variously referred to as scoring, roping, spalling, etc., occurs in highly-loaded spiral-bevel axle gears on the road when running at high speed, or on the application of overloads at moderate speed, such as dropping in the clutch while coasting down hill. Scoring is characterized by scratches in the direction of sliding between the mating teeth and appears to be caused by the welding of small areas of the contacting surfaces under the influence of high heat of friction and high unit pressure. Scoring does not occur in our laboratory tests, because the tests are designed to produce failure by breakage,

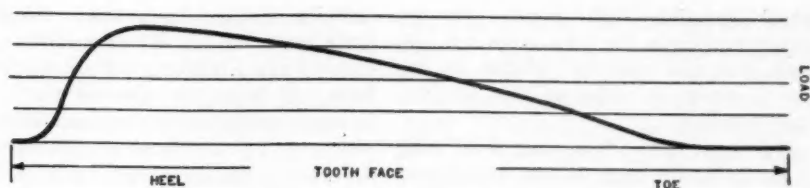


Fig. 15—The composite of the loads of three teeth in simultaneous contact, the qualitative distribution of load along the pitch line of the pinion tooth

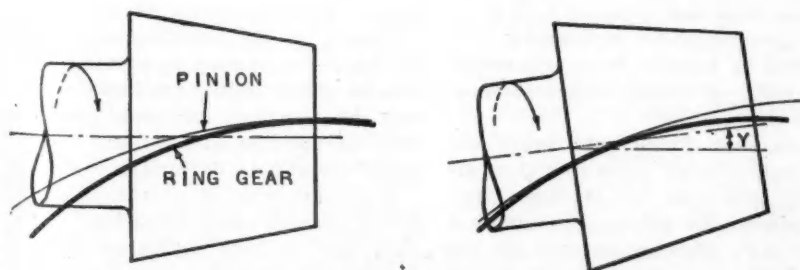


Fig. 14—Shows the compromises made to accommodate the teeth to a wide range of loads

which demands high stress. In the laboratory tests, the unit pressures are high, but the rubbing velocity is too low to generate sufficient heat to produce welding.

The same procedure that was used to obtain basic data on the resistance to breakage of gear teeth was followed to obtain basic data on gear scoring; that is, service records were examined to find the gear designs that scored in normal owner service and to determine the conditions under which this type of failure occurred. The designs that scored in service were then compared with designs that were free from this type of trouble, with the object of finding a practical measure for predetermining scoring tendency. The etching tests previously discussed supplied data for finding the unit pressure over the tooth surface. On the assumption that the instantaneous temperature is proportional to the product of unit pressure and the sliding velocity for poorly lubricated surfaces, a series of calculations were made to determine the pressure-velocity (PV) values over the tooth surface under various operating conditions. These calculations gave the greatest PV value at the top of the pinion tooth under a load corresponding to direct drive at road speeds somewhat below the maximum speed of the car.

In service scoring had been found to occur at high driving speeds and on severe use of the clutch on coasting. The latter condition did not permit calculation, since the applied loads were unknown, but the PV values calculated from the etching tests for forward drive agreed well with service experiences. A number of production cars and buses, some of which were subject to scoring and others in which no scoring had occurred, were calculated for PV factors under the conditions producing maximum PV values. The results are shown in Table III. It will be seen that no scoring occurred in the gears having PV values of less than 1,500,000, in which P equals the Hertz pressure in lb. per sq. in. and V the rubbing velocity in ft. per sec. All gears having PV values above 1,800,000 were subject to occasional scoring in service when lubricated with ordinary mineral oil. For purpose of design, a high PV limit of 1,500,000 is used for gears lubricated with ordinary mineral oil. In designs having higher values of PV, an E.P. lubricant must be used. For production spiral bevel gears, a mild type of E.P. lubricant is satisfactory. It should be remembered that these data have been taken from production, carburized, spiral-bevel gears, and that they do not necessarily apply to other forms of gears such, for example, as hypoids, in which the sliding

velocity is somewhat greater. The formula used for all PV calculations was derived from the one series of etching tests. It is to be expected that there is some variation in the load distribution over the surfaces of the teeth in different spiral-bevel gear set designs, but the formula used gives values sufficiently accurate for practical purposes.

Stress concentration promotes scoring, just as it promotes breakage and pitting, particularly on the coasting side of the teeth. Since scoring in forward drive occurs at relatively low torque, when deflections are small (see Fig. 13), the load on the teeth is more uniformly spread over the surfaces of the teeth. However, the compromises that are made to accommodate the teeth to a wide range of loads, as illustrated in Fig. 14, prevent attainment of the best conditions. Warp, runout, spacing errors, etc., also in-

fillings. This is due to the greater smoothness and in some instances to the work hardening of the bearing surfaces with use.

It is important to produce the maximum hardness of the surfaces of the teeth. In the heat-treating process, it sometimes happens that a thin surface layer is soft. This layer is so thin that it cannot be detected by the penetrating type of hardness testers, and recourse is had to the file test as the most practical and reliable method for determining surface hardness, especially in the hands of a skilled operator. Skin softness may be caused by decarburization where the gear is too long exposed to air while at a high temperature, or it may be the result of the sequence of operations followed in carburizing and hardening the gear. High drawing temperature, either in the furnace or through running too hot in service, may soften the gears and aggravate scoring.

Table III

Car	Scoring	Pinion R.P.M.	Pinion Torque Lb. Ft.	Compressive Stress Lb./Sq. In. "P"	Sliding Velocity Ft./Sec. "V"	"PV"
1	None	2400	328	71,900	16.70	1,200,000
2	None	3450	112	73,400	18.42	1,355,000
3	None	3710	100	84,700	16.40	1,392,000
4	None	3720	96	94,700	14.75	1,402,000
5	None	3820	90	87,200	16.05	1,403,000
6	None	3850	87	87,600	16.20	1,420,000
7	None	2970	91	80,000	17.85	1,430,000
8	None	4060	92	88,200	17.05	1,505,000
9	Occasional	3600	118	80,000	19.35	1,548,000
10	Occasional	4000	95	86,600	17.80	1,551,000
11	Occasional	3800	107	92,500	17.10	1,595,000
12	Serious	3600	97	109,200	15.40	1,676,000
13	Serious	3800	109	108,000	16.60	1,800,000
14	Bad	4266	88	79,300	23.25	1,848,000
15	Bad	3510	90	101,200	18.32	1,852,000
16	Bad	3800	109	95,800	20.05	1,932,000
17	Bad	2400	328	75,000	26.75	2,010,000

crease the scoring tendency. Reducing the rubbing velocity is effective in reducing scoring. This may be accomplished by reducing stress concentration factors to secure adequate resistance to breakage with a finer pitch and shorter teeth.

The most practical remedy for scoring is the use of an E.P. lubricant. Economy of material and weight demands the smallest gears that will carry the load, and by using E.P. lubricants, the gears for automobile rear axles may be designed from this standpoint, with, of course, due consideration to noise.

It has been found that gears are more likely to score when new than after they have been run for some time. For moderate PV values, it is sufficient that an E.P. lubricant be used for the original filling of the axle. Ordinary mineral oil may be used for subsequent

Other Types of Wear

Wear may be distinguished from scoring as a process in which the rubbing surfaces are wasted away. Wear may be slow lapping as a result of abrasives. When the lapping particles are large, such as sand or metal particles, scratched surfaces that resemble scoring may be observed. Fine abrasives, however, leave smooth surfaces. Abrasive materials may be introduced through insufficient cleaning of the gears, carrier or housing; they may be present in the lubricant, or they may be composed of metal particles from the surfaces of the teeth, as from initial roughness or incipient scoring.

Wear may also be a process of corrosion through chemical action. Materials such as free sulfur or chlorine, in the presence of water, will form acids that will attack the metal sur-

faces, unless there is also present in the lubricant a material that acts as an inhibitor to this action. For example, lead soap, in the case of a "lead soap plus free sulfur" E.P. lubricant, is an inhibitor for this type of corrosion. This corrosive action may pass unnoticed because the surfaces of the teeth retain their polish, since the products of corrosion are constantly rubbed off. E.P. lubricants depend on chemical activity for their action. Such lubricants are normal mineral oils to which have been added one or more of several chemicals that will combine chemically with the surfaces of the teeth to form a thin protective coating that prevents welding and, therefore, scoring. If this coating is rubbed off, a new coating is formed. Each time the coating is removed, some of the tooth material is lost. The difference in action of E.P.

lubricants and corrosive agents is that the chemical bond is stronger and, therefore, can better resist being rubbed off. The quantity of metal removed by corrosive agents is large, whereas the quantity removed by E.P. lubricants is extremely small.

Ball bearings do not wear when lubricated with clean inert oil. When wear is observed in ball bearings, it may be taken as evidence that the oil used contains corrosive acids or abrasives.

Oil

Besides supplying lubrication in the lower load range, oil is a cooling agent. More often than not, the oil used in gear sets is too viscous to function as a good coolant, and frequently in high-speed gears the quantity used is so great as to add heat through churning.

The use of low viscosity oil not only improves cooling but reduces churning losses. The viscosity of the oil that is doing the actual lubricating is the viscosity corresponding to the temperature of the metal to be lubricated. When the metal temperature is high, the oil viscosity is low, notwithstanding the apparent high viscosity of the oil in the housing. The use of low-viscosity oil does not mean correspondingly low viscosity as a lubricant, but does mean reduced metal temperature and increased efficiency. These statements in regard to the effect of viscosity are true only when the oils that are being considered are equal in their E.P. or their "oiliness" properties. There may be cases where small differences in the inherent E.P. or "oiliness" properties of the oils make appreciable differences in these results.

Two Will Remember

Continued from page 679

a number of prizes for a contest to be run by "vehicles having three or more running wheels, and deriving their motive power from within themselves."

A course 54 miles in length had been laid out, running north from the Midway and Jackson Park to Evanston and returning by a different route to the starting point. Elaborate rules had been drawn up to make the contest a real test of the ability of these "horseless carriages" to go over a fixed course under their own power.

A heavy snowfall two days before the race made the test far more difficult than its sponsors intended. Of 11 entrants, only six succeeded in getting to the starting point that Thanksgiving Day.

The six were, in the nomenclature of the times, "the electrobat of Morris and Salom, the gasoline wagon of the Duryea Motor Wagon Co., the Benz wagon of the H. Mueller Manufacturing Co., the Benz wagon of the De La Vergne Refrigerating Machine Co., the Roger wagon, owned by R. H. Macy and Co., and the electric wagon of Harold Sturges."

Morris and Salom realized before the race began that with the drag of the snow raising their electric consumption to several times normal, they would be unable to finish the course with the charge carried by their 1600 pounds of storage batteries.

The Duryeas got off to a good start, completed the course, and after the finish left under their own power. The race was not, however, without mishap for them. They had not been able to finish in time a new and improved vehicle and competed with their two-year-old experimental machine which

had run several thousand miles over country roads, and had the steering gear damaged in a recent accident. They led from the start, but were passed by Macy's Roger when their steering gear broke. After repairing their steering gear, the Duryeas again took the lead and their car was the only one to finish the race. They had taken 10 hours and 28 minutes, of which 7½ hours were running time. Average speed, allowing for delays, was about 7½ miles an hour.

The judges awarded the gold medal to Morris and Salom for "the best showing in the official tests, for safety, ease of control," etc. The award of \$2,000

went to the Duryeas for the best performance in the road race.

The Thanksgiving Day contest of 1895 started a series of motor vehicle races in America and served to arouse public interest in the "horseless carriage." That these vehicles, previously looked upon as freak toys of impractical inventors, could travel through snow drifts that blocked trains and hampered horse traffic, came as a decided surprise to the American public. National pride was aroused because an American-built car was the only one to finish, leaving the heavier European machines stalled or broken down in the snow.

AUTOMOTIVE INDUSTRIES Also 40 Years Old

Earliest of the ancestors of AUTOMOTIVE INDUSTRIES was THE HORSELESS AGE. When the first number of THE HORSELESS AGE came out in November, 1895, it had the distinction of being the first journal in the English language published in the interests of the motor vehicle. Abroad, only LA LOCOMOTION AUTOMOBILE had preceded it in this field. E. P. Ingersoll, 157 William St., New York, was the publisher of THE HORSELESS AGE.

THE AUTOMOBILE, also a monthly, was started in 1899 by the E. L. Powers Co., 150 Nassau St., New York. In 1902 the Class Journal Co. was formed and it purchased THE AUTOMOBILE, which

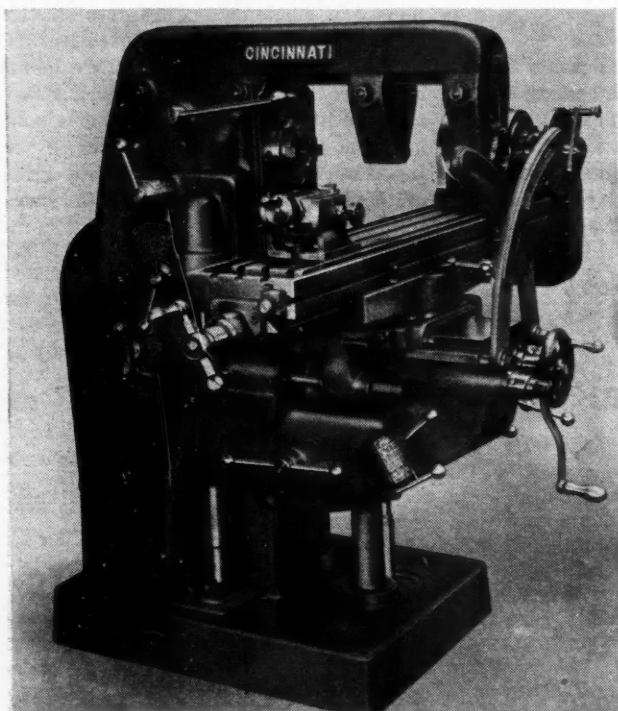
was merged with the MOTOR VEHICLE REVIEW (a weekly), and continued as a weekly under the name of THE AUTOMOBILE and MOTOR VEHICLE REVIEW. Later, the title reverted to the original name of THE AUTOMOBILE, and it continued as a weekly.

Following the SAE trend, THE AUTOMOBILE changed its name to AUTOMOTIVE INDUSTRIES with the issue of July 12, 1917, thereby broadening its scope to cover the design, engineering and production activities pertaining to the use of the internal combustion engine on land, air or water.

THE HORSELESS AGE was bought by AUTOMOTIVE INDUSTRIES the following year.

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools



Cincinnati
Universal
Miller

New Tool Room Miller

The Cincinnati No. 2, L-type universal miller, recently put on the market by Cincinnati Milling Machine and Cincinnati Grinders, Inc., of Cincinnati, Ohio, has 15 spindle speeds, ranging from 23 to 1200 r.p.m., arranged in approximate geometrical progression. Twelve feeds are available, the longitudinal travel ranging from $\frac{3}{4}$ to 30 inches per minute. Feeds may be engaged from the front or rear working position, while the spindle is stationary, running, or actually under cut.

The 3-hp. motor, which drives the drill through adjustable V-belts, is mounted in the column of the machine. Rapid power traverse is available in six directions and is controlled in such a way that immediately upon release of the control lever, the motion of the unit under consideration changes to a feed rate. The direction of spindle rotation may be reversed by means of the motor reversing lever on the side of the column, which starts, stops and reverses the motor. A multiple disk type brake instantly stops the spindle

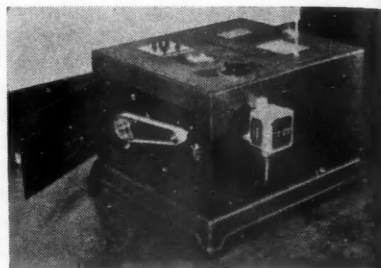
when the starting lever is disengaged.

Convenience of operation is said to have been very carefully considered in the design of this machine, all control levers being within easy reach of the operator.

Sperry Adher-O-Scope

The Sperry Adher-O-Scope is designed to determine the adhesive power of lubricating oil. By measuring adhesion, in addition to viscosity, it is claimed that oil manufacturers can grade lubricants according to load-carrying ability, and can establish specifications which will better reflect performance. In the Adher-O-Scope, a thin film of oil on the periphery of a rapidly spinning rotor is subjected to high centrifugal force. All particles of oil not held by adhesion are thrown off, and the thickness of the boundary layers is then determined by weight.

In order to accurately measure this weight, a specially constructed band which fits over the rotor is used for testing purposes. Before the rotor is



Adher-O-Scope

set spinning, this band is thoroughly cleaned, and then weighed on an analytical balance. After proper distribution of oil on its outer surface, the band is placed on the rotor and spun at a fixed speed for a predetermined time.

The speed of the balanced rotor is accurately controlled from 0 to 20,000 r.p.m. by means of a variable transformer. Provision is made for maintaining a uniform temperature within this instrument while tests are being made.

The Adher-O-Scope is a product of Sperry Products, Inc., Brooklyn, N. Y.

New Coatings Produce Impervious Films

Technical Coatings, Inc., 11 Park Place, New York City, is producing a new line of protective coatings said to be free from porosity and impervious to water and corrosive atmospheric gases. The base is a combination of pure vegetable gums and heat-treated oils, but does not contain any linseed oil or synthetic resins, and forms a film that is elastic and one that will not peel, chip or crack, according to the makers.

Primers with the new non-porous base are available for various purposes and are applicable not only to metal surfaces, but also to wood, concrete or plaster. Application is by brush, spray or dipping.

Correction

On page 563 of *Automotive Industries* for Oct. 26, 1935, the description covering the extension of Allis-Chalmers' line of sheaves refers to their line of Duro-brace Texsteel sheaves, rather than their line of vari-pitch sheaves, as indicated.

Getting a Leap on LEAP-YEAR!

HE'S MAKING A CALL NOW THAT WILL
MEAN 366 DAYS OF SAVING NEXT YEAR

● He's made a discovery. Lubrication shows up under many headings on the past year's cost sheets. There were repair bills due to faulty machine lubrication, production difficulties resulting from cutting fluid problems, tool costs—and always labor costs and delays when lubrication failed.

All of these must be totaled in order to measure lubrication costs or effectiveness. The call he is making *now* will establish new records of economy in his plant throughout the whole of next year. He is calling his local Standard Oil office.

What Standard Service Can Do

It cuts costs and eliminates problems by three definite assurances: (1) unexcelled quality and range of products; (2) practical cooperation of experienced and competent lubrication engineers; and (3) dependable availability and prompt delivery of the product needed. Using this single source for all lubricants and other petroleum products produces measurable savings in costs; is also a convenience for the entire plant.

... and it can happen to you

"Let a test tell the tale," said a manufacturer of steering gears. The Standard Oil Engineer recommended Acme Cutting Oil. In three months an actual purchasing saving of over \$350.00 per month was shown. Further, a definite saving in longer tool life over the first five months of the previous year.

A puzzle they were unable to solve brought a call for a Standard Oil Engineer from a company near Chicago. They were having serious trouble in the application of Acme 150 Cutting Oil, used in cutting galvanized nipples. These turned black on being rinsed in a conventional alkaline solution. An inspection of routine was made and a paraffine oil bath was recommended immediately after cutting. This eliminated all discoloration, besides reducing manufacturing costs.

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STANDARD OIL COMPANY (INDIANA)

CORRECT LUBRICATION

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☐ "The Lubrication Engineer" ☐ "Lubrication in Gear Cutting Operations"
☐ —His Value to You—

(Attach list of any additional subjects in which you are specifically interested)

Name

Position

Company

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City

State